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The Technique of Surgical Gynecology

Detailed Illustrations to a Description of the Technique of Gynecological Operations

BY

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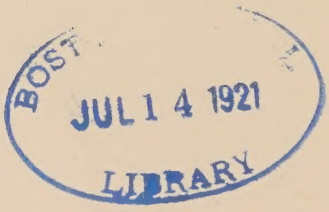

PREFACE.

The purpose of this work is to describe with sufficient fullness and clearness of detail the operative technique of the more common gynecological operations, that it may serve as a guide to the operator who is not thoroughly familiar with them. Unfortunately works on gynecology are lacking upon this point, and many men are obliged to operate without either having assisted at or witnessed them at close range. The book is, therefore, devoted exclusively to operative technique, preparation for operations and after-care of the patient, giving no space to diagnosis or a discussion of the necessity for operation. Thus it presupposes that the necessity for operation has been decided when familiarity with its technique is desired.

As a rule but one method of procedure has been described for each condition, that which I have found most satisfactory in its execution and most successful in its results. This obviates confusion and responsibility of selection.

I would direct especial attention to the chapter on "Preparation of the Patient for Gynecological Operations," and urge that it be read carefully. I hope that it will bear fruit and result in more care being given to the preparation of patients for operation, particularly

abdominal operations, whereby much unnecessary suffering may be averted and the results of these operations may be less frequently unsuccessful. There is no excuse for the annoying intestinal distention, either upon the operating table or afterwards, or for the distressing retching and vomiting following anæsthesia that often mars the result. It all can be avoided by careful painstaking preparation.

Another feature to which I would invite attention is the large number of illustrations, nearly all of which are from original sketches by Messrs. Havelka and Reisman, made at the time of the operations.

AUGUSTIN H. GOELET.

New York, 1900.

To my friend and colleague

HOWARD A. KELLY, M.D.,

in acknowledgment of his achievements in gynecological surgery,
and in appreciation of many acts of personal kindness,
this book is dedicated.

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CHAPTER I.

PREPARATION OF THE PATIENT FOR GYNECOLOGICAL OPERATIONS.

The importance of careful preparation of the patient for gynecological operations cannot be overestimated, especially where the peritoneal cavity is to be invaded. The better the general condition of the patient and the digestive apparatus, and the more active the excretory organs, the better she will bear the anæsthetic and shock of the operation, and the less the disturbance following it; hence, the smoother the convalescence. Thorough preparation is, therefore, necessary, not only for the safe administration of the anæsthetic and the comfort of the patient, but also to overcome intestinal distention, which retards and at times seriously interferes with the operation.

Unless immediate operation is imperative, it is most unwise to submit a patient to anæsthesia or an operation involving exposure of the peritoneal cavity, without sufficient preparation to secure activity of the intestinal tract, and of the liver and kidneys as well. It is not sufficient to clear out the bowels once with calomel, and a saline cathartic, nor is the exclusion of albumen and sugar from the urine all that is necessary. The presence of bile in the urine, which denotes improper action of the liver, or rather absorption of the bile, because it is not discharged normally into the intestinal tract, is often a more serious contra-indication to the administration of an anæsthetic than the presence of albumen or sugar.

When an anæsthetic, especially ether, is administered to a patient whose urine is loaded with bile, there is always unusual disturbance of the respiration and circulation. The patient will breathe badly and cyanosis will occur suddenly and most unexpectedly, and often great quantities of bile

will be ejected from the stomach, both during the administration and after the anæsthetic has been discontinued. In these cases, also, there is always unusual disturbance of the stomach for several hours, or several days, in some instances, afterwards. Accompanying this there is also extreme gaseous distention of the intestines which complicates convalescence and renders it extremely and unnecessarily unpleasant. All this may be avoided by careful, thorough, and in some cases, prolonged preparation tending to promote a normal discharge of bile into the intestinal tract and obviate its absorption and elimination by the kidneys.

Bile is the great intestinal antiseptic and purifier, and its presence in the intestines prevents acid fermentation and promotes intestinal digestion. Its absence permits fermentation and consequent gaseous distention. Its presence in the urine indicates that it is not being discharged normally into the intestines, but is being absorbed into the circulation and eliminated by the kidneys and skin.

A rough test for bile in the urine, which serves well enough for clinical purposes, is as follows: Pour about two drams of the urine into a test tube and bring it to the boiling point over an alcohol flame or a Bunsen burner; then add six or eight drops of C. P. nitric acid. If bile is present, the reaction is reddish, reddish brown or dark brown, according to the degree of contamination. If the acid is added while the urine is still at boiling point, the reaction is at once pronounced, but if it has cooled off it must again be placed over the flame and again brought to the boiling point. The change becomes more pronounced after the specimen becomes cooled off after being submitted to heat and the reagent. It may be rapidly cooled when necessary by placing the heated end of the test tube containing the specimen under a stream of cold water.

It is not sufficient to examine one specimen for albumen, sugar and bile, but several taken on different days and at different times of the day. It is important that we should know our patient and all about her that is possible to be

known, before submitting her to the risk of anæsthesia or an operation that may prove useless or unsuccessful because her condition was not wholly understood, or because she was not properly prepared for it. Therefore, in examining a patient for operation, the heart and lungs should always be carefully examined when the question of operation first comes up, instead of postponing it until just before beginning the anæsthesia. A specimen of the urine should then be submitted to thorough tests, the results of which are recorded with the history, as follows: The specific gravity; test for albumen, sugar and bile; then the sediment should be submitted to careful microscopical examination; afterwards several specimens should be submitted to the same examination for verification of the first result, and the variations noted in the record.

GENERAL PREPARATION OF THE PATIENT.

Preparation for Minor Gynecological Operations.—In minor gynecological operations it will be sufficient, in the majority of cases, to give the patient only a few days' or a week's preparation, unless the condition calls for more prolonged treatment. During this time the intestinal tract must be thoroughly emptied every second day, giving such remedies as tend to promote increased elimination of bile into the intestines. Calomel is one of the best drugs for this purpose, and when there is any objection to it podophyllin may be substituted. Twelve to eighteen calomel triturates, 1/10 grain each, administered all at one dose at bedtime, followed in the morning by 30 or 40 grains of bicarbonate of soda in a large cup of hot water, or two teaspoonfuls of phosphate of soda in hot water, usually act very satisfactorily. The ordinary compound cathartic pill, given two at bedtime the first night, followed by the soda in hot water in the morning, and one every second night thereafter, I have found also very satisfactory.

The diet should be simple and easily digested, avoiding foods containing starch and all sweets, so as to obviate fer-

mentation. A strict diet of beef and dry, crisp toast, buttered when eaten, will be most satisfactory. In cases requiring minor operations, after excluding albumen and sugar from the urine it is only necessary to eliminate the bile when it is found in the specimen, so as to avoid the unpleasant effect of the anæsthetic, and for the same reason the intestinal tract is cleared out. The preparation has no direct bearing upon the operative procedure. It is instituted solely for the safety of administration of the anæsthetic and for the comfort of the patient. Of course, the result of the operation is influenced, many times, by the general state of the patient's health. In rheumatic cases, for instance, and where the urine is found to be loaded with bile, preparatory treatment should be continued until that is overcome. If the patient's condition is decidedly below normal, time should be taken to correct this if the operation is not urgent; and if the condition for which the operative procedure is instituted is not directly responsible for it, then, of course, it would be wiser to operate and build up afterwards.

It is better not to give a slow acting cathartic or liver stimulant the evening immediately preceding the operation, but to give a quick, active saline early on the morning of the operation, at least four or five hours before the time appointed, and when this acts, wash out the colon with a large enema of warm water, using at least two quarts. After this no food should be allowed, but if the patient is in feeble health and requires it, a cup of liquid beef extract or beef juice may be given, not nearer than two hours to the time fixed for the operation. Nothing containing alcohol should be allowed.

During the time devoted to preparation the patient should be given daily baths to cleanse and stimulate the activity of the skin, followed by brisk rubbing. In feeble subjects alcohol may be used after the bath. These baths are given preferably during the evening, not earlier than three hours after the last meal of the day. They are usually followed by refreshing sleep. When it is necessary to tone up the

system, the shower bath, given in the morning, is to be preferred, and in conjunction therewith static electricity may be employed together with tonics, as the condition may suggest.

Preparation for Major Gynecological Operations.—In major gynecological operations, where the peritoneal cavity is to be invaded, the preparatory treatment requires more time if we desire to get the patient in the best possible condition to withstand the anæsthetic and the shock of the operation and to insure a smooth convalescence. In some cases, when the general condition is fairly good, a week may be sufficient time to devote to preparation, but in the majority of cases requiring abdominal operations, the general system, digestive apparatus and excretory organs are, as a rule, so much deranged that much more time is required, and it is not often possible to accomplish what is necessary in less than two or three weeks.

In no instance should an abdominal operation be done if there is persistent intestinal distention, or the urine shows a strong reaction of bile, unless the operation is urgent and does not permit of delay. The practice of submitting women to abdominal operations after one or two days' pretense at preparation cannot be too strongly condemned. The conscientious surgeon will not operate until his patient is in the best possible condition for the ordeal, and until the risk of both the anæsthesia and the operation has been reduced to a minimum.

The preparation in these cases should consist in a strict diet, devoid of sweets, starchy foods, milk and all foods that are prone to ferment. It should comprise beef, prepared and cooked in a manner most easily digested, cooked white of egg, clear beef essence in lieu of soup, crisp toast with butter, coffee without sugar, but with cream, and lettuce with salt or lemon juice only, and celery. The quantity of such food taken need not be restricted, but as much may be eaten as the appetite calls for if it digests readily and does not create disturbance. Sometimes these patients cannot even take toast, and this must be omitted for a few

days; then when taken again takadiastase, or some other preparation of diastase, should be given after every meal. Alcoholic stimulants should be strenuously avoided.

The intestinal tract must be thoroughly emptied every second day by administering in the evening previous some cathartic that will stimulate the liver, as calomel, podophyllin or phosphate of soda in hot water. When the urine contains much bile it is best to give an active cathartic of this kind every third or fourth night, and to give a copious draught of hot water, containing bicarbonate of soda or the phosphate of soda, every night and morning in the interval. The dose in the morning should be given a full hour before any food is taken into the stomach, so that digestion may not be interfered with. The urine should be tested every day, the specific gravity and the amount of bile present serving as a guide to the energy of the treatment to be instituted. Most women drink too little water, and therefore should be encouraged to drink freely of pure water, not too cold. When it is found that this advice is not followed, an enema of a pint of normal salt solution should be given every day at a time when it can be best retained (some little time after the bowels have ceased to act is probably best), and the patient must be impressed with the necessity of retaining it permanently so as to be absorbed, for there is an impression always that any enema that is given must come away. This serves to stimulate the activity of the skin and kidneys.

Daily baths should be given, followed by brisk rubbing, and where deemed expedient, gentle massage. Rubbing with alcohol may be resorted to in feeble subjects. The method of giving the bath is not unimportant; also the time of day. When the patient does not sleep well, it is better to give it at night before retiring, but usually the morning, on awakening, is best. When a stimulating, tonic effect is desired, the shower bath is to be preferred. Most women think they cannot stand a shower bath. This is a great mistake. The shower should be arranged so that the water can be tempered to make it agreeable. At first the patient

may demand that it be quite warm, but after a few days she will ask to have it made cooler, because it is more agreeable and because she feels better afterwards. There is no doubt that the shower bath is more stimulating than the other form of bath. For the purpose of cleansing the skin the surface should be well soaped and scrubbed with a coarse cloth or brush, and a shower given after. This prepares the skin for a cooler bath than could otherwise be endured. These baths should be continued up to the day of the operation.

The preparation as outlined should be continued up to the evening preceding the day of the operation, when the patient should be given a brisk cathartic which has no special stimulating action on the liver, and if the operation is to be done in the morning of the following day, no food is given afterward. If the operation is not to be done until the afternoon, it is best to defer this last cathartic until the morning, giving it three to four hours after a light breakfast taken early.

The colon must be thoroughly washed out by copious enemata several hours before the operation. It is of the greatest importance to have the intestinal tract emptied of food when the abdomen is to be opened. The anæsthetic will be better borne, will be more easily taken, and there is very much less disturbance of the stomach during and following the operation.

The time of day to operate is of some importance. There can be no doubt that for many reasons the early morning is the best time. The patient is fresher after a night's rest and has not so long a time to anticipate the operation, and the stomach is empty. The atmosphere is more invigorating and the light is better, yet the early afternoon is preferred by good operators, because, perhaps, it is more convenient, and because they feel that more time is thus given to the immediate preparation.

CHAPTER II.

PREPARATION OF THE FIELD OF OPERATION AND IMMEDIATE PREPARATION OF THE PATIENT FOR OPERATION.

Preparation for Operations in and Through the Vagina and its Outlet.—The preparation for curettage and other operations within the uterus may be limited to sterilization, so far as it is possible to do so, of the vulva and vaginal surface. To facilitate this, an antiseptic distention irrigation* with a hot, non-irritating antiseptic solution should be used twice a day for two or three days prior to the operation. (I prefer an antiseptic liquid soap, which is used for sterilizing the hands†.) The evening before, or the morning of the operation, the vulva is shaved, all the hair about the vulva, perineum and anus being removed thoroughly up to the mons veneris. (The shaving of the pubes may be omitted in minor operations.) Then the vulva is washed thoroughly, being lathered with the antiseptic soap on a flat gauze pad, the vagina being then irrigated with a one per cent. solution of the soap with which the vulva is also irrigated to remove the lather. The vulva is then dried with a sterile towel or piece of sterile gauze, and a dressing of dry markasol on a piece of gauze is applied to the vulva and held in place by a sterile napkin pinned in front and behind to a band encircling the waist. This is not removed until the patient is placed on the operating table.

*Distention irrigation of the vagina consists in using a vaginal shield that will compress the vulva over which it fits, when pressed against it so that the solution will be retained until the vagina is distended. When this is accomplished the pressure against the shield is relaxed and the solution escapes from the vagina with a rush against the shield which protects the hand. This manœuvre is repeated until the reservoir is exhausted. Three or four quarts should be used. This is the only method by which the vagina can be cleansed satisfactorily by irrigation. The author has perfected an apparatus for this purpose, together with a portable reservoir which is illustrated elsewhere. See Fig. 14.

†See chapter on Hand Sterilization.

Whenever the urine is voided, the vulva is again irrigated and a fresh pad applied.

It always insures greater cleanliness to shave and thus prepare the vulva beforehand, but in an emergency, when time is not permitted for previous preparation, or when the patient seriously objects, it may be deferred in minor operations until she has been anæsthetized and placed upon the table.

The same preparation must be carried out for all operations within and through the vagina in order to secure asepsis, and to avoid infection by contact of the hands and instruments with the surface of the vulva and the hair surrounding it, upon which there are always to be found infecting germs unless so cleansed.

The operations that require such preparation are curettage or other operations within the uterus, the repair of lacerated cervix, amputation of the cervix, vaginal fistulæ and repair of lacerated perineum, as well as anterior and posterior colporrhaphy.

When a vaginal incision opening into the peritoneal cavity is to be made, the pubes and abdomen must also be shaved, and must be scrubbed and sterilized, because frequently the operator is obliged in the midst of such operations to place one hand on the abdomen for the purpose of palpating through the abdominal wall, while one or two fingers of the other hand are inserted through the vaginal incision into the peritoneal cavity. Sterilization of the pubes and abdomen is likewise necessary when for any reason it may become necessary to examine by palpation the contents of the pelvis while the patient is under anæsthesia for some minor operation about the vagina or vulva. When the abdomen has not been sterilized a sterile towel must be thrown over the abdomen to protect the surgeon's hand from contact with it.

When a laceration of the cervix is recent, and the cervical structure is still soft and no enlarged Nabothian follicles are found, no special local preparation is required beyond a hot douche containing some non-irritating antiseptic

(markasol in one per cent. solution), given twice a day for two or three days preceding the operation. This is done for the purpose of cleansing the surface of the vagina and removing tenacious secretion, and to favor emptying of the distended glands, and should be done by the distention irrigation method described above.

Where the laceration is of long standing, the cervical structure being dense and studded with distended Nabothian follicles whose ducts have been obstructed, a longer period of preparation will be required. In some instances

FIG. 1. Represents Buttle's spear for puncturing enlarged Nabothian follicles.

two or three weeks will be necessary to get the structure in favorable condition for prompt union. The distended Nabothian follicles must be punctured with a spear (Buttle's) shown in cut, Fig. 1. Many of them may be detected by exposing the cervix by means of a speculum in the vagina, drawing it down with an angular tenaculum forceps, and wiping away the secretion from the cervix with a pledget of cotton in the grasp of the dressing forceps. Many of these cysts will, however, escape observation, especially those that are deep-seated. These can be detected by palpating the surface with the finger, and to open them the spear must be plunged deeply into the structure of the cervix. The operation for repair of the laceration should not be undertaken until all such distended follicles have been emptied, and they have healed without refilling. As the cervical infiltration subsides upon relieving the distention and obstruction to the circulation by emptying the larger follicles, smaller ones will be observed. It is therefore a good plan to have the patient return every second day during the period of preparation. The cysts then detected are punctured, and if the cervical structure is dense, it is painted with tincture of iodine, and a tampon soaked in glycerine is placed against the cervix. This is to be re-

moved by the patient in 12 to 24 hours, by pulling on the string attached, and a vaginal douche of at least four quarts of hot water is used immediately after. This irrigation should be repeated twice a day when the tampon has been removed from the vagina. This plan, if carefully carried out, softens the hard cervical structure, relieves the infiltration, and reduces the size of the cervix materially, and at the same time it relieves the associated hyperemia.

When the external os and the canal of the cervix are found studded with granulations, they are to be scraped

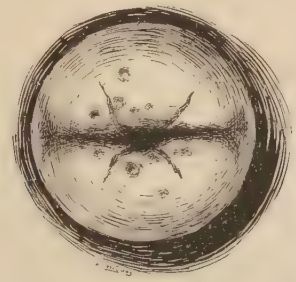

FIG. 2 Showing lacerated cervix with enlarged Nabothian follicles.

off carefully with a sharp curette, going up into the canal of the cervix as far as the constriction of the internal os, if necessary. This should be done early in the preparatory stage of treatment, and immediately after tincture of iodine is applied by means of an applicator (preferably of hard rubber), wrapped at the end with a bit of absorbent cotton. The whole denuded surface should be touched with the iodine once thoroughly, thereafter, every second day when the patient returns for treatment; it should be dusted with iodosol—a stimulating dusting powder, an iodine compound, which stimulates healing without irritating. If the action of glycerine is desired, iodine may be combined with it in the proportion of one dram of tincture of iodine to four ounces of glycerine applied on tampons. Whenever possible it is better to get the surface healed completely before operating for the repair of the laceration. If such

preparatory treatment is carefully carried out, very many cases where amputation of the cervix seems to be demanded will be so much improved that repair of the laceration will be all that is necessary and the cervix may be preserved.

When previous preparation of the field of operation has been completed, as outlined above, and the patient has been placed on the table, the vulva dressing is removed, and while the thighs are held well apart by a leg-holder, the vulva, pubes and abdomen and the inner part of the thighs, and the exposed part of the buttocks and anus are again lathered with the liquid soap and scrubbed with a nail-brush, and afterwards the surface is washed off with a stream of sterile water from a reservoir or pitcher. Then distending the vulva orifice with the index and middle fingers of the left hand, some of the liquid antiseptic soap is poured into the vagina, and with a pledget of sterile gauze in a sponge-holder forceps, or the dressing forceps, the vagina is thoroughly scrubbed, going over every portion carefully. The soap is then washed away with a stream of sterile water. Solutions of bichloride or carbolic acid should not be used in the vagina when preparing it for operation, because they sometimes irritate or denude the surface.

When absolute sterilization of the vaginal surface is desired, as when the peritoneum is to be invaded through a vaginal incision, the distention irrigation with a one per cent. solution of the antiseptic soap should be given twice a day for two days prior to the operation, then twelve hours before the operation the vagina is scrubbed with the soap and a pledget of gauze in the grasp of the dressing forceps, then washed out with a stream of sterile water, the surface dusted thoroughly with markasol, and the vagina filled loosely with either plain sterile gauze or gauze impregnated with the markasol, five per cent. A similar dressing is applied to the vulva, which has been previously shaved and scrubbed. These dressings are not to be removed until the patient is placed on the operating table. It will then only be necessary to wash the surface with a stream of sterile water before proceeding with the operation.

A rubber air cushion, with flaps leading into a bucket at the foot of the table, should be placed under the buttocks. The feet and legs of the patient are protected by drawing over them long stockings made of canton flannel which have been sterilized. These should extend above the knees, where they are tied with tapes to keep them in place.

A dry sterile towel is then spread out over the thigh on each side of the patient, another across the pubes, and another transversely on a level with the perineum. These towels are pinned together and also to the clothing to keep them in place, as shown in the illustration. (Fig. 3.) Thus a rectangular opening, just sufficient to expose the vulva, is left uncovered.

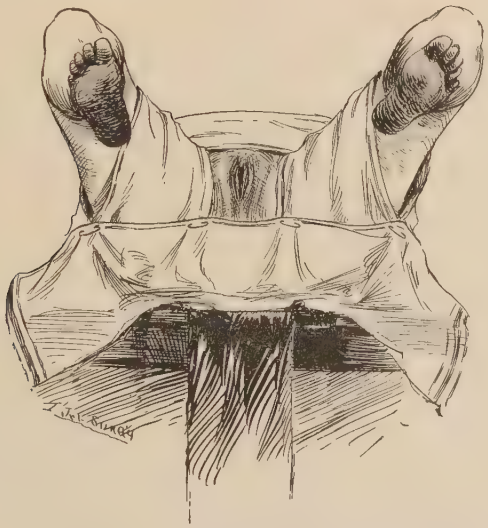

FIG. 3 Lithotomy position, showing arrangement of towels about thighs, buttocks and abdomen, exposing only the vulva. The feet should be encased in the stockings described in the text.

Preparation for Operation Involving Incision of the Abdomen.—The surface of the abdomen for a considerable distance around the location of the proposed incision must be rendered sterile. The surface must first be shaved so

as to remove even the smaller hairs, and also that covering the pubes. This should be done for the median incision between the umbilicus and pubes, and also for incisions for shortening the round ligaments, and for removing the appendix. Although the surface not immediately involved is covered during the operation with sterile towels, these may become displaced during the necessary manipulation, and the instruments or hands of the operator or assistant may become soiled by contact with parts not prepared.

To effect perfect sterilization of the skin surface, it should be first shaved, then washed thoroughly with nail-brush and the antiseptic liquid soap, taking pains to scrub out the depression of the umbilicus with the nail-brush, but if the skin is thin and tender, as in delicate children and light-haired women, a pad of gauze is substituted for the nail-brush. After washing the surface in this manner it is rinsed off with sterile warm water, and a dressing of the liquid soap is applied for six or eight hours to soften the skin, as follows: A pad of four thicknesses of sterile gauze large enough to cover the whole surface, is laid out on a flat, clean dish and the liquid soap is poured over it, and spread out over the entire surface of the gauze. This is then applied smoothly to the skin surface with the soaped side down. Over this, and extending over the margin of the gauze pad two inches all around, is placed a layer of sterile, non-absorbent cotton, which is held in place by two broad strips of adhesive plaster, stretched across from side to side beyond the layer of cotton. Over this is placed an ordinary obstetric binder. Upon removing this six or eight hours later, the surface is again washed off with the same soap and a pledget of gauze, then it is rinsed off with sterile water. The surface is dried with a sterile towel, dusted thoroughly with dry markasol, and a pad of sterile gauze is placed over this and held in place by adhesive strips and a bandage as before. This dressing is not to be removed until the patient is placed upon the operating table, when the powder is brushed off with a pledget of sterile gauze, and the surface is washed off with a stream of warm sterile

water. No further washing or scrubbing will be necessary if the dressing has been retained in position. The markasol applied in this manner relieves any irritation of the surface produced by the scrubbing, and being antiseptic tends further to render the surface sterile.

The patient is brought to the operating table rolled in a blanket, which thoroughly protects the limbs, and over this is thrown a sheet. A pair of long canton flannel stockings are drawn over the limbs and tied around the thighs near the groin, covering and protecting them completely. These are drawn on as the blanket is removed, without removing the sheet. The sheet and blanket should both be sterile. The night-dress and under-vest of the patient are now drawn up under the shoulders and folded up in front across the bust. A surgical air-cushion is placed under the hips and back so as to protect the table. Care must be taken to have it free from all clothing or wrappings that encircle the patient. The dressings are now removed from the abdomen and the surface is washed off as described above. Then all but a small rectangular surface at the site of the proposed incision is covered by dry sterile towels. First, a sterile towel is folded over the clothing across the bust, and another over the edge of the blanket or sheet in which the legs are wrapped, which has been pushed down to the level of the lower part of the pubes. Next, a similar towel folded longitudinally in half is placed lengthwise on the abdomen, the inner folded border coming to within two inches of the median line or location of the proposed incision. Another towel is placed similarly on the opposite side. The upper and lower ends of these towels respectively, are pinned to the folded gown above and to the blanket below with safety-pins. Another similar towel is placed across the pubes and hips, the upper border of which reaches up to within an inch or two of the lower limit of the proposed incision. This is pinned on each side to the towels laterally placed. A similar towel is placed across on a level with or just above the upper limit of the proposed incision, and this is likewise pinned on each side to

the towel beneath it. The lower border of this last towel will be on a level with the umbilicus, or above it, according to the length of the incision, if this can be decided beforehand. (See illustration, Fig. 4.)

If the incision is to be made over the appendix or over the internal abdominal ring for shortening the round liga-

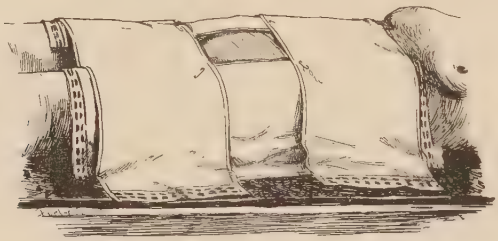

FIG. 4. Showing arrangement of towels on the abdomen so as to protect all but the site of the incision. The bust and legs should be covered also.

ments, the towels are placed in the same manner so as to expose only the surface two inches on each side of the proposed incision.

So far as preparation of the patient and field of operation are concerned, everything is in readiness for the operation when these instructions have been carried out.

CHAPTER III.

PREPARATION OF THE OPERATOR, ASSISTANTS AND NURSES FOR GYNECOLOGICAL OPERATIONS.

Personal cleanliness is particularly essential in the gynecological surgeon and his assistants and nurses as well, for their own comfort, for the impression on the patient, and for its influence upon the result. The difficulty of enforcing cleanliness outside of a hospital or sanatorium is fully recognized, yet persuasion and force of example will do much to accomplish what is necessary in this direction. The man who does not recognize the need of a daily bath for his own comfort and satisfaction is, strictly speaking, not fit for a gynecological surgeon, and what is necessary for him is equally if not more necessary for his assistants, because frequently they come more intimately in contact with sources of infection. It is well known that the skin harbors germs, and the perspiration of the operator and his assistants is therefore a source of infection. The importance of daily baths to keep the skin clean and active, so that the perspiration may evaporate readily, is quite apparent, and they should be indulged in by those who take part directly in all operations, particularly where the peritoneal cavity is opened. The Turkish bath now and then will aid materially in keeping the skin clean and active. Previous to every abdominal operation, therefore, the same day, the operator and his assistants, including the nurses, should take a bath and scrub with the antiseptic liquid soap used for cleansing the hands. This is advised because it cleanses more thoroughly than ordinary soap.

Perfect results will not be obtained and should not be expected in this branch of surgery until asepsis is extended to every detail in preparing for an operation, as well as in the technique of the procedure. The time and energy con-

sumed in such preparation should not be considered other than in the light of absolute necessity. The surgeon cannot be too particular, and nothing short of absolute asepsis should be tolerated.

A complete change of clothing, especially the underclothing, should be made immediately before the operation and before the hands are sterilized. It is necessary both for the sake of cleanliness on account of the operation, and also for the comfort of the operator, because those worn during an operation may become wet with perspiration, particularly if the weather is warm or the operation is fatiguing. Then those that have been removed are fresh and dry for him to put on afterwards. In a hospital or sanatorium, a special suit of underclothing may be kept sterile and ready. For work at private houses such a suit may be carried in the bag with the aprons. The first assistant should likewise wear fresh, sterile underclothing when assisting in an abdominal operation. This should not be considered an unnecessary refinement. It is conducive alike to comfort and successful surgery. The outer garments must also be fresh for the occasion, and should consist of a pair of white trousers and jacket that buttons up closely to the neck in front and also a pair of canvas bath-shoes, all of which have been sterilized. The bath-shoes with rope soles are better because they bear repeated sterilization. Such a suit with the shoes should also be carried in the bag with the aprons for operations at private houses. The assistants should wear similar suits and shoes. In addition, the operator and assistants should all wear white linen caps that cover the head and hair completely, fitting over the forehead below the hair line, passing back behind the ear on each side and under the occiput. Unless it fits tight enough to remain in place, it should have draw-strings so that it may be tied at the back. A sterile gown or apron is put on over this suit after the hands have been sterilized.

The nurses should wear fresh suits, put on immediately before the operation. These should have short sleeves, or

the sleeves should be rolled up to the shoulder. Over this, after the hands and arms have been sterilized, a sterile gown that completely envelopes her is put on. This gown should also have short sleeves that are closed around the arm above the elbow with draw-strings. The nurses should also wear sterile canvas shoes, and the head should be enveloped completely with a cap that confines the hair. This is very much more essential for nurses than for the operator and his male assistants, because their hair is constantly falling out or breaking off.

Before sterilizing the hands, a temporary rubber apron is put on to avoid wetting or soiling the suit, and this rubber apron must also be sterilized. This is to be removed and replaced by a sterile gown afterwards.

Sterilization of the Hands.—There are several methods of sterilizing the hands, more or less reliable, and every operator has some special preference upon which he pins his faith. There are some who contend, with some degree of truth, that it is not possible to sterilize the hands, and therefore, after scrubbing them thoroughly, put on rubber gloves that have been sterilized by boiling, compelling their assistants and nurses also to wear them. There can be no doubt that this is the most important detail of individual preparation for an operation, since it is well known that infecting germs (the staphylococcus always and the streptococcus frequently) are present on the hands of all persons, and that ordinary washing with green soap or scrubbing for ten minutes with a nail-brush does not remove them.

Every one who takes an active part in an operation or touches anything to be used after it has been sterilized, should sterilize the hands, forearms and arms half way up to the shoulder. This should be done even when rubber gloves are to be used, for they only cover the hands and wrists. Unquestionably the use of rubber gloves makes asepsis more certain, since however sterile the hands may be at the beginning of an operation, they may become a source of infection later if they prespire. Then, too, if the

hand comes in contact with pus during an operation, it is more easily removed from the surface of the glove than from the bare hand, because it can be immersed in stronger antiseptics, or they may be exchanged for a fresh pair.*

There is, however, a great objection to the use of gloves, because they render manipulations more awkward, and hence the operator is necessarily slower. They are always either sticky or slippery. If they are considered necessary, it is more important that they should be worn by the nurses and assistants, who are less apt to be as thorough with their preparation than the operator, because they are less interested and feel no responsibility. Let us hope that every operator is sufficiently interested in the result to make him thorough with his preparation. If he can feel that he is, he may dispense with rubber gloves himself and thereby shorten the time consumed in the operation, an item that is often as important as sterilization of the hands. If his hands have been exposed to infection during one operation and another operation is imperative immediately after (the same day), the use of gloves is a wise precaution.

Whatever method of sterilization is to be employed, the hands, forearms and arms half way to the shoulder are to be scrubbed thoroughly with nail-brush and soap (preferably synol soap), having the water as warm as can be comfortably borne, and paying particular attention to the folds about the joints, the surface between the fingers, around the roots of the nails and under the nails. After being scrubbed, the nails, which should be kept trimmed short, are carefully cleansed with a blunt-pointed stick or a dull nail-blade and scrubbed again. They are then rinsed off in warm sterile water before antiseptic solution is applied.

Method of Sterilization with Chloride of Lime and Carbonate of Soda.—After being washed as above described, while they are still wet, a heaped teaspoonful of chloride of lime is taken in the palm of one hand, with a

*I have found the Standard rubber gloves most satisfactory because they are seamless and so thin that the sense of touch is not much impaired.

lump of carbonate of soda (ordinary washing soda), the size of a hickory nut, and wetting it thoroughly, it is rubbed carefully over the whole surface while decomposition is taking place, which liberates the chlorine. Thus the surface, already softened by previous washing and scrubbing, is submitted to the action of freshly liberated chlorine. After about a minute or two, the lime is washed off with clean sterile water.

The chief objection to this method is the strong odor of chlorine left on the hands for several hours after, and it roughens and cuts them so that they will not bear frequently repeated applications of this kind.

Method of Sterilization with Permanganate of Potash and Oxalic Acid.—After the cuticle has been cleansed and softened by washing, as described above, the hands, forearms and arms half way up are stained with permanganate of potash and afterwards bleached with oxalic acid. Two basins are required, and they are half filled with sterile water as warm as can be borne by the hands. Into one basin, sufficient permanganate of potash is placed to make a saturated solution, and into the other oxalic acid to the point of saturation. The hands are first immersed in the permanganate solution, and the hands, forearms and arms are bathed and rubbed with it until the integument is stained a deep brown. Every part of the surface must be stained. Then the solution remaining on the surface is rinsed off and the hands are dipped into the oxalic acid solution. The forearms and arms are bathed with this as before until the entire surface is decolorized and the integument is thoroughly bleached. The oxalic acid is then rinsed off with warm sterile water.

There is no objection to this method, except the time it requires, and if the cuticle has been thoroughly softened by careful scrubbing before, it may be depended upon to effect sterilization.

Method of Sterilization with Synol.—It has been thought impossible to make an antiseptic soap that will sterilize the hands without roughening or injuring them. Yet this

seems to have been accomplished with synol, which is an antiseptic liquid soap. Instead of roughening the hands, it makes them soft and smooth. Both clinical and bacteriological tests have convinced me that the hands can be rendered positively sterile by thorough, careful scrubbing with this preparation and a nail-brush for five or six minutes. When, however, the forearms and arms also are to be sterilized, ten minutes are required.

The method of using it consists in scrubbing the surface thoroughly with a nail-brush, upon which a quantity has been poured. It is used full strength, but the surface should be wet thoroughly first by immersing in water as warm as can be borne. Two basins are required, filled with warm sterile water, one for wetting and washing the hands and the other for rinsing, and they should be far enough apart to avoid splashing from one to the other. The kind of basin to be employed is not unimportant. The ordinary stationary basin with stopper and chain is dirty and cannot be made sterile, therefore, it should never be used. Portable basins of enamel or porcelain are to be preferred, because they may be sterilized by boiling or dry heat. The nail-brushes should be previously sterilized by prolonged boiling, for half an hour at least. It is better to use a new brush every time, since the cost is trifling. It is, of course, necessary to sterilize a new brush also; boiling it for five minutes in a two per cent. solution of synol will be sufficient. The whole surface must be gone over thoroughly and scrubbed carefully, particularly about the joints, both back and front, the inner surfaces of the fingers, and the roots of the nails and under them. The hands and nails should be scrubbed separately first for two minutes. Then the nails, which should be kept trimmed short, must be cleansed carefully with a dull-pointed stick or a dull nail-blade. Then they should be again scrubbed with the nail-brush for three minutes more.

The best plan is first to wash the surface of the hands, forearms and arms well by rubbing the soap well into the surface with the hands, then take a square pad of several

thicknesses of gauze, wet it, and pouring some of the soap upon it, use it thoroughly as a wash-rag on the whole surface, particularly on the arms, then rinse off and use the nail-brush with the soap afterwards. There should be no guessing about the time consumed. The time of scrubbing must consume five minutes for the hands and another five minutes for the forearms and arms. The soap is to be rinsed off thoroughly in two separate basins of water or under a stream of sterile water from a pitcher or faucet. This is necessary to remove all the soap thoroughly, otherwise the hands will be slippery.

Every assistant, except the anaesthetizer, and every nurse participating in any way in the operation, should undergo such preparation.

The temporary rubber apron is removed after the hands have been sterilized, and it is replaced by a sterile gown that reaches to the ankles and envelopes the body completely. A word of caution is necessary regarding this change. The rubber apron should be unfastened and removed by some one whose hands have not been sterilized, and the operating gown should be handled and fastened only by one whose hands are sterile.

It is well to have ready a three per cent. solution of the soap with nail-brush standing convenient, where the operator or the assistant may reach it if required to cleanse the hands during the operation if they become contaminated. Scrubbing for a minute will usually suffice then.

CHAPTER IV.

ARRANGEMENT AND PREPARATION OF THE OPERATING ROOM.

Whenever possible operations should always be done in a special room set aside for this purpose, and in a hospital or sanatorium this room should not be used for anything else. It is unwise under any circumstances, even in a private house, to operate in the same room with the bed the patient is to occupy during convalescence, because the room requires ventilation after the operation, and because the patient should have absolute quiet when recovering from the anæthetic. The smell of either remains in a room for many hours after an operation, even when all the doors and windows are wide open. It is important to have the patient put to bed in another room where she will not be disturbed by rearrangement of the room necessary after an operation.

There is no doubt that it is easier to secure asepsis in a well regulated hospital or sanatorium than in a private house, but there is no doubt that just as good work can be done in a private house. The preparation requires a little more time and attention, that is all. The surgeon may go prepared to meet any emergency that may arise.

In a Hospital or Sanatorium.—The operating room should be as far removed as possible from the bed rooms or wards occupied by patients, that they may not be disturbed by the noise or even be cognizant of what is going on. It should be large enough not to be crowded by the presence of the assistants and nurses required, and should be lighted by a skylight and a large window on one side, at least. Additional artificial light should be provided for by a cluster of electric lamps or Wellsbach burners under a reflector arranged immediately over the operating table, but

high enough to be out of the way. The ceiling of the room should be high, and there should be a ventilating register on two sides of the wall near the ceiling, connecting with air shafts or funnels leading to the roof.

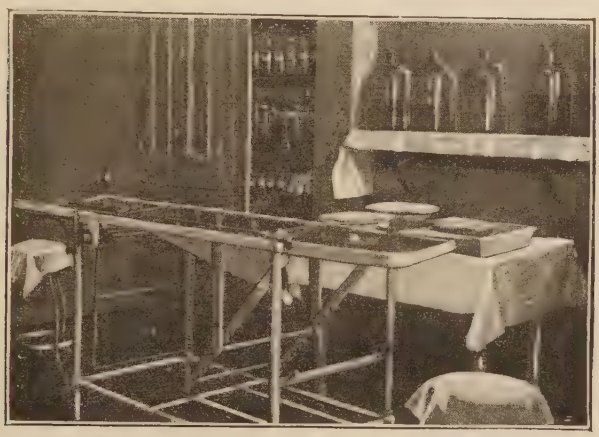

FIG. 5. Arrangement of small operating room.

The heating appliance should be arranged so as to maintain an even temperature, and this and the ventilation of the room should be looked after during the operation by some one especially assigned for that purpose. This is more especially important when there are spectators present. Steam pipes or radiators are the best means of heating, though better ventilation is undoubtedly secured by hot air. The dust, however, that comes in through the hot air pipes is a serious objection. During an operation where the abdomen is opened the temperature should be kept between 75° and 80° F.

The walls, ceiling and woodwork should be painted white and varnished to render the surface impervious. Unless the flooring is tiled it should be covered with one piece of thick linoleum without seams, and this should extend under the base board all around. A piece of molding is also nailed down tightly all around to cover the crevice be-

tween it and the base board. This linoleum should be plain, without figures painted on, and should be given a coat of varnish or shellac after it is put down to render it impervious. It is better to put under it a lining of felt to ruffle the sound if the room beneath is one that is occupied.

FIG. 6 Arrangement of hospital operating room.

A room prepared in this manner may be washed thoroughly with a hose if desired. After every operation the walls, ceiling, and floor should be scrubbed with soap, and before the next operation they should be washed again and afterwards wiped thoroughly with a 1 to 1,000 solution of bichloride of mercury. After septic cases the room should be left open and exposed to the air and light for two or three days at least, before using it for another operation.

The operating room should not contain anything superfluous, and there should be no permanent shades or curtains to the windows to collect dust. The windows should

have ground glass, or when necessary to obstruct the view from without, temporary sash curtains of sterile gauze may be adjusted fresh each time.

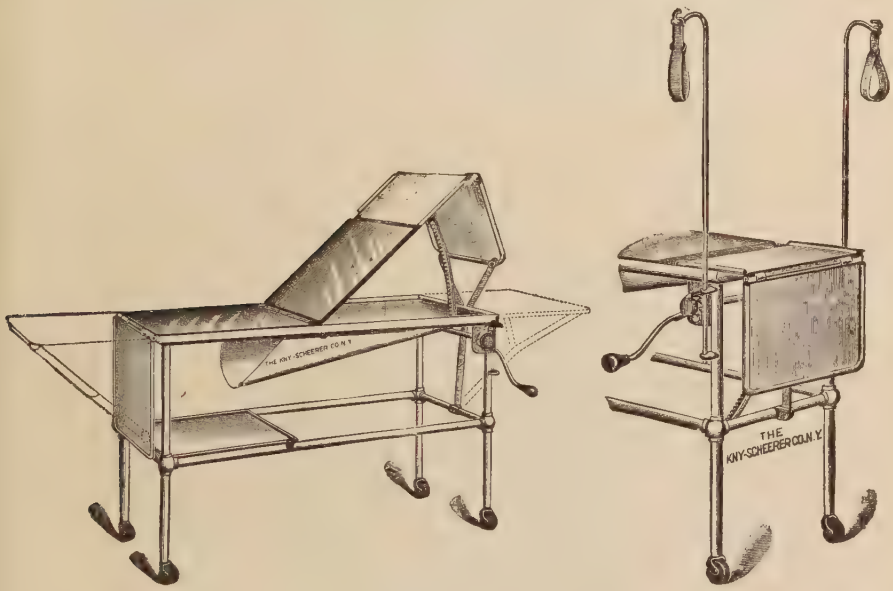

FIG. 7. Gynecological operating table.

The furniture should be of white enameled iron, and the operating table should be of the same, with movable glass top. The top should be arranged so as to be quickly and conveniently converted into an incline for the Trendelenburg position. At one end there should be adjustable upright rods with straps for leg supports. In addition to this there should be three side tables with glass tops—each covered with a sterile towel, one for instrument trays, one for jars containing dressings, ligatures and solutions, and one on which are placed basins for washing sponges or pads during the operation. There should be also two stools, each with a basin on it for a hand douche, placed conveniently for the operator and the first assistant, and also a stool for the anæsthetizer, and one for the operator when

doing vaginal work. For this work another stool will also be required for the nurse, who holds the perineal retractor. It will be a great convenience also, and at times a necessity, to have a long, low bench 6 inches high, 10 inches wide, and 24 inches long, upon which the operator may stand when the patient is elevated into the Trendelenburg position.

The solutions are used preferably from large, wide-mouth percolators, with tubing attached at the bottom, and

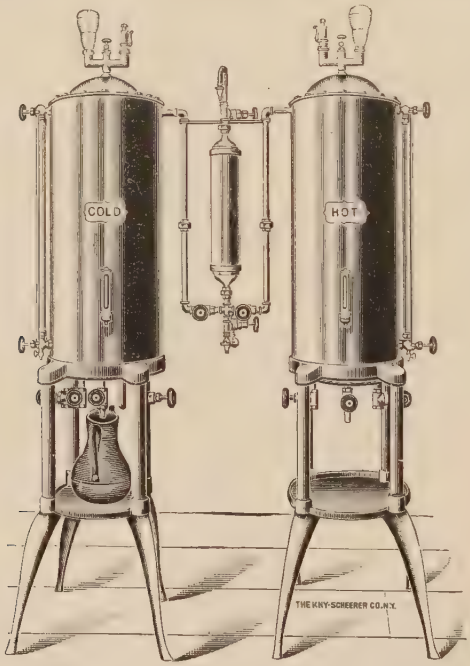

FIG. 8. Apparatus for sterilizing water.

these should be arranged on a slide, so it may be lowered for refilling and raised to any desired height. But the salt solution is more conveniently used from a pitcher, being prepared fresh when required.

It is the custom in some hospitals to have the sterilizing apparatus and basins used by the operator and assistants

for washing up and preparing, in the operating room. This is a mistake. The sterilizer should be in another room, and there should be a separate preparation room, where the operator and assistants can wash and scrub up. There should be, however, in the operating room an appliance for furnishing hot sterile water. The cold sterile water is kept preferably in large glass-stoppered bottles on a shelf in the operating room.

There should be a special nurse in charge of the operating room, whose duty it is to see that every detail of its preparation and arrangement for the operation is carried out. During the operation she has supervision over all the other nurses, and she is held accountable for all instruments, sponges and dressings that are used. The first assistant has supervision over her and the assistants, and he should inspect the room before the operation to see that nothing has been overlooked. Thus the operator is relieved of all responsibility of minor details.

The nurse should provide an abundant supply of towels that have been carefully sterilized and kept until required in covered sterile receptacles, free from exposure, and also a number of gauze pads of different sizes to be used in place of flat sponges. These are made of four or eight thicknesses of gauze with the raw edges turned in and sewed down, and a quilt stitch the whole thickness from corner to corner both ways, crossing in the middle, to hold them in shape. Those that are to be employed in the abdominal cavity should have a tape about four inches long attached to one corner. When inserted into the abdomen a hemostatic forceps is attached to the free end of the tape to prevent it from being drawn into the cavity. The most convenient sizes for these pads are 3½x4, 5x6 and 8x10.

Instead of round sponges artificial sponges are used, because they can be made more certainly aseptic. They are made of a round roll of absorbent cotton, the size of a walnut, surrounded by two thicknesses of gauze, the margins of which are drawn together over the cotton and sewed firmly, the frayed ends being cut off close. These are prepared of sterile material, and are sterilized again by dry heat or

in the Sprague sterilizer with the other things enumerated above.

The head nurse should carefully count all of these pads and sponges taken out to be used during an operation, and must record the number of each size; and before the completion of the operation every one must be accounted for and found, so as to avoid leaving any in the abdominal cavity. She must not trust to her memory, but must write the number down on a slate or pad. During the course of the operation she should carefully observe every time a pad is inserted into the cavity, making a mental note thereon, and whenever one is removed and not immediately replaced by another, it must be deducted from the number inserted. She must train herself to remember this detail, for there will be no opportunity to write it down. Thus a needless search for a missing pad that is not in the abdomen may be avoided. It is well for the first assistant to make the same observation for verification. This will save time in closing the abdominal wound.

The second assistant has charge of the instruments, under the supervision of the first assistant, who should always look them over after they are arranged, to see that none have been omitted that may be required. After being sterilized they are placed in shallow glass or white enameled pans and covered either with plain sterile hot water or a solution of carbolic acid 1 to 20 or a 1 per cent. solution of lysol. They should be arranged in the pans, all of one kind together, with the cutting instruments (knives and scissors) in a pan by themselves, and the hemostatic and broad ligament clamps also in a separate pan from the other instruments.

Sterilization of Dressings.—Dressings should be sterilized in quantities, and kept in sterile, glass-stoppered bottles, with wide mouths; but they should be resterilized if kept longer than a month, or if the contents of a jar become contaminated inadvertently. The dressings, gauze, cotton and gauze pads, gowns, suits, and small dishes of all kinds, are best sterilized by steam, under a pressure of 15

or 20 pounds for half an hour. For this purpose the Sprague sterilizer is perhaps the best.

Sterilization of Ligatures and Sutures.—Silk is best sterilized by winding it loosely on glass spools and placing it in a large test tube, covering it with water, and boiling it for half an hour on three successive days. It is then preserved by placing it in a sterile glass-stoppered bottle and covering it with sterile alcohol, sealing the top with paraffine. It is taken from this bottle, when required, with a pair of sterile forceps.

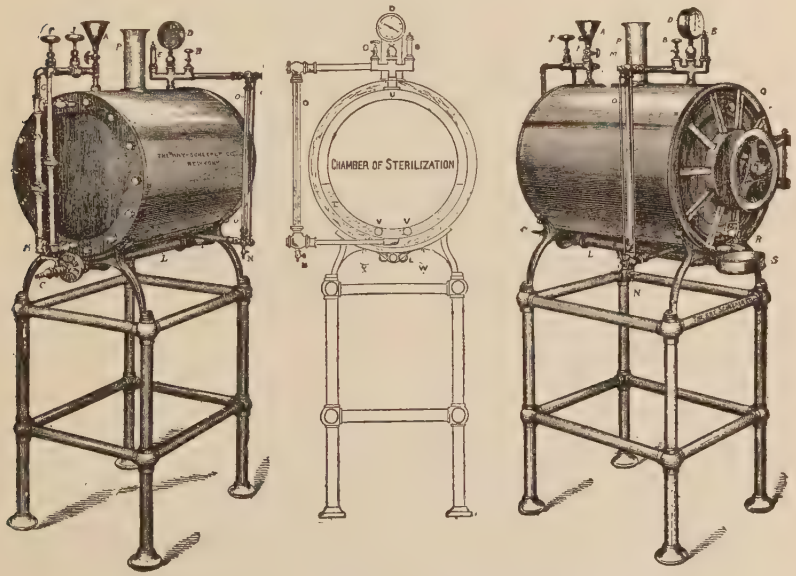

FIG. 9. Sprague sterilizing apparatus.

Catgut comes now already prepared, sterilized, and preserved in sealed glass tubes containing alcohol in which it has been boiled under pressure. The tubes are broken and opened only when required for use. I have found that prepared by George St. Johns Leavens perfectly reliable and satisfactory, and do not now use any other. Both the plain and chromicized catgut are put up in this manner in different sizes.

When it is desired to prepare catgut in quantities it may be sterilized satisfactorily in cumol, according to the modification of Kronig's method employed in the Johns Hopkins Hospital, as follows—viz.: The cleanest specimens of catgut are selected:

"1. Cut the catgut into the desired lengths and wind 12 strands into a figure of 8 form, so it may be slipped into a large test tube.

"2. Bring the catgut gradually up to a temperature of 80 C. and hold it at this point for an hour.

"3. Place the catgut in cumol, which must not be above a temperature of 100 C.; raise it to 165 C., and hold it at this point for an hour.

"4. Pour off the cumol, and either allow the heat of the sand bath to dry the catgut or transfer it to a hot air oven at a temperature of 100 C. for two hours.

"5. Transfer the catgut, with sterile forceps, to test tubes previously sterilized as in the laboratory in which it is preserved for use."

If the catgut comes in contact with the bottom of the test tube it may become brittle; hence a piece of sterile cotton is placed in the bottom of the test tube and the heat is slowly and gradually raised to the required point. Care must be observed in employing the process to prevent the ignition of the cumol, which is very inflammable, and for this reason a copper wire netting should be placed over the beaker glass containing the cumol while the heat is applied. A special cumol sterilizer, constructed by Mr. A. V. M. Sprague, at the suggestion of Dr. John G. Clark, is the best apparatus for this purpose.

Silkworm gut is sterilized by boiling it for half an hour in a 2 per cent. solution of lysol. It is preserved in the same solution until required. This process renders it nearly as pliable as catgut. The uneven ends are cut off, and each strand is wiped thoroughly by drawing it through a pledget of absorbent cotton or gauze, saturated with ether, held between the thumb and fingers. The strands are then placed lengthwise in a long glass tube sealed or corked at

one end. This tube is filled with a 2 per cent. lysol solution cold, and the open end is plugged with cotton. It is then placed in a boiler or sterilizer containing water, with

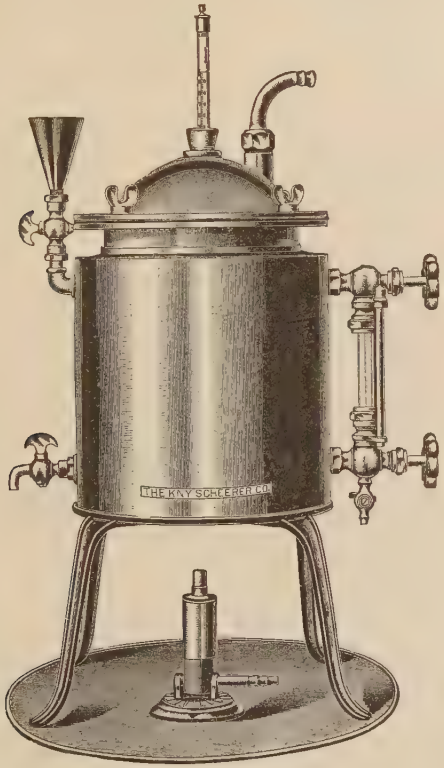

FIG. 10. Cumol sterilizer.

FIG. 11. Long glass tube for holding sterile silkworm gut sutures.

one end resting on the bottom and the other supported above the surface of the water high enough to prevent the solution from running out. It is boiled for half an hour.

Before removing the tube from the boiler the cotton is removed from the open end and a sterile cork is inserted. When required for use the strands are removed with sterile forceps. It is safer always to resterilize it before using it again after it has been once opened, and to use a fresh solution each time.

Sterilization of Instruments.—After they have been used, instruments should be washed thoroughly with a pledget of gauze on the smooth parts and a nail brush on the serrations and locks, using the synol soap employed for sterilizing the hands. Then they should be wrapped in towels—all instruments of a kind together—put into a boiler with a 2 per cent. solution of synol and boiled for five minutes. Scissors may be treated in like manner, but should be wrapped separately from the other instruments, care being taken to see that they are all closed and the edges not exposed to injury against the others. Scalpels should be washed as above, and afterwards be grasped at the centre by the handle with a pair of sterilized forceps and every portion passed slowly through an alcohol flame. To do this quickly a large flame is necessary, which is secured by pouring a quantity of alcohol into a saucer or small basin and igniting it.

Instruments that are injured by boiling—such as wax catheters, bougies and hard rubber goods—are sterilized by immersion for half an hour in synol full strength. Nail brushes may likewise be sterilized in this same manner, and boiling, which injures them, is thus avoided.

If the instruments are to be put away, they must be carefully dried with sterile towels and placed on glass shelves in a sterile case that is kept locked. Before they are used again they should be again sterilized as described above, but the washing is unnecessary. The former is necessary, because they may become infected by the dust settling on them in the case from opening and shutting the door. After this sterilization they are not dried, but are conveyed directly from the boiler to the pans, ready for operation, sterile forceps being used for this purpose.

In a Private House.—When the urgency of the opera-

tion does not prevent it, a nurse should be sent to the house the day before with full instructions as to the preparation, and when the operator arrives with his assistants everything should be in readiness to begin with the anæsthesia. But when the operation is urgent a smart nurse can accomplish a great deal in two hours if she has competent assistants.

The first thing to be done is to select a light, airy room, on the second floor, if possible, and if the weather is cold see that there are facilities for properly heating it. Then all the curtains, draperies and pictures should be removed, together with all unnecessary furniture. Then the carpet should be taken up, or it should be covered thoroughly with new oil-cloth carefully tacked down, covering the carpet completely. Then the whole room—walls, ceiling, window frames, door frames and doors—must be dusted thoroughly and afterwards gone over with a cloth wet with a solution of bichloride of mercury 1 to 1,000. If the carpet is removed the floor must be swept and scrubbed well with washing soda. After it has dried it should have a coat of wood-filling, then a coat of shellac, taking care to fill all the cracks. They both dry very quickly, and if 24 hours is allowed for the preparation it will be sufficient. The articles of furniture and other things required are put in the operating room just before the arrival of the operator, so as to avoid unnecessary walking over the floor after it has been prepared. The chairs, tables, etc., to be used in the operating room, if not new, should be scrubbed with washing soda, wiped off with the solution of bichloride and given a fresh coat of shellac.

The nurse must see to the sterilization of everything that is to be used about the patient during the operation—towels, sheets and blankets, and her clothing which she is to wear in the operating room, and her gown that is to be put on afterwards. She should have the patient get two dozen towels, and these should be boiled for two hours after the stiffening has been removed by washing with soft soap. These should be wrung out by the nurse

or one of her assistants only after the hands and forearms have been sterilized. They should be dried, preferably in the sun, but in a room free from dust or other source of contamination. If there is not sufficient time for them to dry they should be dipped into a hot 1 per cent. solution of lysol and wrung as dry as possible and used damp.

The other articles—sheets, blankets and clothing—may be sterilized by dry heat in an oven after they have been washed clean and ironed. They are rolled up or folded and wrapped in clean towels, then put into the oven. They must be watched carefully, and the oven must be well regulated to prevent burning.

The water to be used at the operation must be filtered and boiled for two hours. This can be done in ordinary large wash boilers, but they should be new and clean. Two of these should be provided.

The water in one should be boiled some time before and set aside covered to get cold, and the other should be kept hot. There should be a new tin dipper for each boiler, which may be left in the water and boiled with it.

There will also be required a clean foot tub, 2 clean buckets, 2 china or agate pitchers of 2-quart capacity and one holding one quart, 4 china or agate basins.

The pitchers and basins should be sterilized by boiling, even if they are new.

The nurse should also have provided 2 pounds of absorbent cotton and 5 yards of absorbent gauze, from which she is to prepare the square pads used in place of sponges, as described above in connection with preparation of hospital operating room.

The furniture required for the operating room will be a table for the operation, 4 feet long by 2 feet wide, and 30 or 31 inches high (an ordinary kitchen table); 2 small square tables, and 4 new kitchen chairs. Those with wooden bottoms are preferable. For operations near by in the city I send an operating table, which may be folded up and carried conveniently under the arm. It is a wooden table, very reasonable in price, but very convenient, because it

may be changed to give any position required for operating, even the Trendelenburg position.

For abdominal operations it is very essential that the operator should be able to get the patient into the Trendelenburg position readily, and for operations in the country the ordinary kitchen table may be so altered as to do this. An extra top, of the same size as the original, can be made

FIG. 12. Portable operating table.

by any carpenter. This should be sawed across 16 inches from one end, which is to be the head of the table. The smaller section is then nailed or screwed firmly to the lower table top, and the larger section below left free, so it may be raised above the other top. Two flat hinges are then attached at the junction, so that the lower or larger section of the top swings on the other like a door.

On the under side of this top is nailed a strip of moulding across near the lower edge. Then two flat strips, 18 inches long, 4 inches wide and 1 inch thick, lying flat between the two tops lengthwise, are fastened to the lower

top by a hinge on each side. Thus when the upper top is raised, and these two strips beneath are lifted up until they catch on the strip of moulding on the under side of the upper top, it is supported at an angle of 45 degrees, and we have the facilities for the Trendelenburg position.

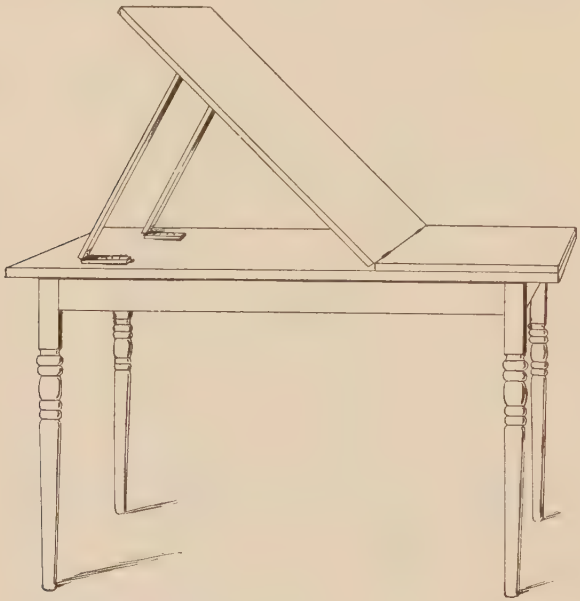

FIG. 13. Showing extemporized table for securing Trendelenburg position.

The small tables must be covered with sterile towels, and the operating table should be covered with a clean blanket, folded several times, or a clean quilt, and over this is placed a clean sheet, which is folded under each corner and pinned securely.

The shades should be removed from the windows, except where necessary to obscure the sunlight if it shines on the operating table, and draw-curtains of clean gauze should be put up to obstruct the view from without when this is necessary. These may be more quickly strung on a stout string attached to tacks on each side of the window frame.

The surgeon takes with him, packed away in two bags,

everything he may require for the operation. The instruments in linen cases, instrument trays, air cushion, leg holder, etc., in one bag, and suits, dressings, bandages, etc., in the other. These are all sterilized before being packed in the bags. As a container for sterilized dressings to be carried in the bag I can recommend the rubber dressing bag, since it can be boiled and rendered aseptic, and it is impervious.

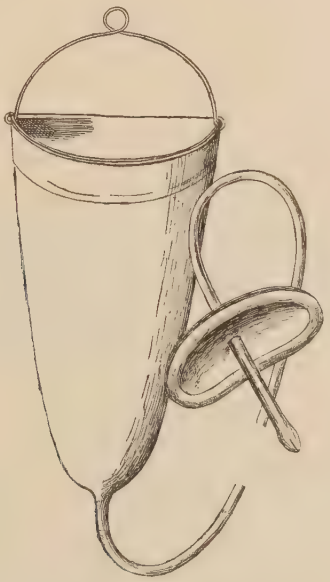

FIG. 14. Author's portable rubber irrigating reservoir with valve shield and vaginal nozzle.

It is by no means necessary to make such elaborate preparations, except when the abdomen is to be opened. For minor gynecological operations strict asepsis is, of course, essential; but the room need not be so completely dismantled as when the peritoneum is to be invaded. All superfluous furniture and the curtains and draperies should, of course, be removed, the room carefully dusted with a damp cloth, and the carpet, after being thoroughly swept, may be covered with crash or fresh unbleached muslin. The other preparations to secure asepsis must be as thorough.

As a reservoir for the irrigating solution, the portable rubber reservoir is very convenient, since it folds up and occupies a very small space in the bag. It holds three quarts, has a wide mouth, which permits it to be turned inside out and washed thoroughly, and it will bear boiling. It is arranged upon a pulley, to be screwed in a window or door frlame, which permits it to be lowered for refilling, or raised and stopped at any height desired.

Author's Aseptic Mirror Gynecological Emergency Case.—This case has been arranged to meet the requirements of aseptic gynecological examinations and operations in private houses. In selecting the instruments only those that are actually essential have been chosen, and useless instruments have been omitted, so as to make the case as compact and as practical as possible. It is suitable alike for the specialist and general practitioner.

The case consists of two white enameled basins, oval in shape, fitted together, with their concavities facing each other, and having hinged catches at each end by which they are fastened securely together. These basins, when separated, are to be used as aseptic basins for holding the instruments in solution while operating.

The instruments are arranged and fastened on three metal trays, fitted one upon the other, that may be removed, leaving the basins empty. Thus any number of instruments required for an operation are selected, placed in one of the empty basins and covered with antiseptic solution or sterile water. When so desired the instruments may be sterilized in the case.

The case contains:

4 (Author's) dull uterine curettes.

1 sharp uterine curette.

1 (Author's) combination uterine dressing forceps and placental forceps (new).

1 (Author's) angular tenaculum forceps.

2 (Author's) uterine double current irrigators; one large, for operating, and one small, for clinical work.

1 pair pointed curved uterine scissors.

1 (Author's) cervix knife.

2 curved broad ligament clamps.
1 (Author's) needle-holder forceps.
1 (Author's) uterine dilator.
1 razor.
1 scalpel.
1 (Author's) vaginal speculum or perineal retractor.
1 bottle of antiseptic liquid soap for sterilizing the hands and for lubrication.
2 aseptic containers for sterile gauze and cotton.
1 iodoform or markasol duster.
1 sealed glass tube of catgut ligatures, assorted sizes.
1 sealed glass tube of silk ligatures, two sizes.
1 metal needle-case with one dozen needles, assorted sizes.

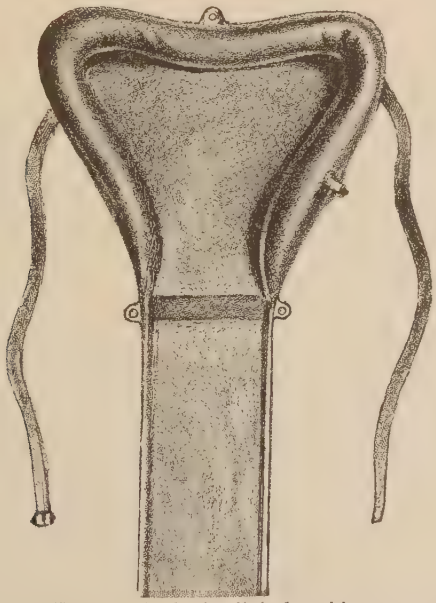

FIG. 15. Author's clinical cushion.

This case is placed in an outside leather case, which contains in addition a clinical air cushion (Fig. 15), a portable rubber reservoir and irrigating apparatus (Fig. 14), and a simple leg holder similar to that shown in Fig. 25.

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CHAPTER V.

CURETTAGE OF THE UTERUS.

Though usually regarded a simple and trivial operation, curettage requires much care and skill to make it effectual and devoid of danger. No routine plan can be adopted to suit every case, but the technique must vary in some important particular in each individual case. The impression has gone abroad that the sharp curette must always be used, and the uterus must be packed (?) with gauze. There was never a greater misconception of the object of an operation. In some instances the sharp curette may be used with advantage, and in careful hands without detriment; in others the dull or semi-sharp instrument only should be used. Sometimes gauze may be inserted into the uterus to secure depletion and drainage, or to control hemorrhage or stimulate contraction, but in some cases it should never be employed. It is evident, therefore, that in dealing with the class of cases requiring this operation there is abundant opportunity for the display of good judgment based upon practical experience.

The sharp curette may be limited to the removal of hardened hypertrophied granulations about the internal os and in the cervical canal, for malignant degeneration, and for detaching pieces of tissue for microscopical examination. The dull or semi-sharp curette, which should have a thin edge, but not a cutting edge like the sharp instrument, and a firm shaft, may be used for all other purposes and will be sufficient to meet all necessary requirements. In most cases it is not a resistant tissue we have to remove, but a structure very much softened from inflammation. It would be most unwise to remove the entire mucous membrane down to the muscular wall in all cases, as appears by some to be considered necessary. It is necessary to re-

move only what is diseased and not firmly adherent, and this can be done with the dull curette such as described.

The instruments required are a perineal retractor (Fig. 16), an angular tenaculum forceps (Fig. 18) for seizing and steadying the cervix. This instrument is simply a double tenaculum forceps, the shaft of which is bent at an obtuse angle about half an inch from the tenaculum

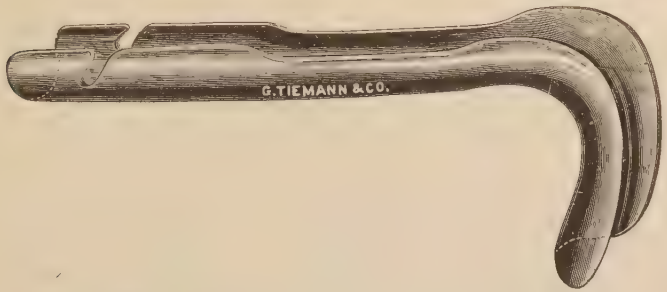


FIG. 16. Delphy's hard rubber perineal retractor.

points, which causes the strain to come against the sides of the tenaculum instead of directly against the points, as is the case with the ordinary double tenaculum, consequently it does not cut into the tissue nor tear out. An additional advantage is that the shaft of the instrument when in use lays along the vaginal wall to one side, out of the way.

FIG. 17. Author's speculum.

The dilator (Fig. 19) possesses some advantages. The curve is adapted to the normal curve of the uterus, and the blades are thick enough to minimize the risk of injuring the structure of the cervix and uterine wall.

The ratchet attached to the handle takes the place of the screw on other dilators, rests the hand, and makes it possible to dilate more gradually. If the instrument starts to slip the ratchet catch can be quickly loosened by the touch of the little finger. It is, therefore, a much safer instrument than the ordinary dilator.

FIG. 18. Angular tenaculum forceps.

For ordinary cases this dilator will answer every purpose, but the extent of the dilatation which it is possible to secure with it or any two branch dilator is limited. When the uterus is soft it may dilate sufficiently to permit the introduction of the finger for exploration of the cavity, but when the wall of the canal is firm something more will be required.

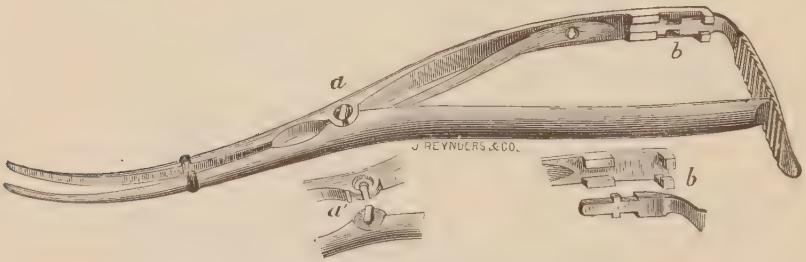


FIG. 19. Author's two branch dilator.

The large conical bougies, represented in Fig. 20, may be used for extending the dilatation when more is required. They are made very much larger than those ordinarily used. They are not, however, satisfactory in every respect. What is needed is a four bladed dilator which will expand sufficiently and not produce injury. Figure 21

shows the author's four branch dilator, which is used with a soft rubber cover over the blades. The blades expand inside of this cover the same as an urethral dilator, which serves as a protection to the canal and uterine walls. The cover, which is previously sterilized, is slipped over the blades of the instrument, while closed previous to its introduction into the canal.

FIG. 20. Conical hard rubber dilator.

Of the curettes there should be six sizes in the set (Fig. 22), five dull or semi-sharp, and one sharp. The ordinary dull curette is a most useless instrument, because the metal of which it is made is too soft to retain an edge, and the instrument bends upon the slightest pressure. The dull curette should have a thin semi-sharp edge but not a

FIG. 21. Author's four branch dilator open.

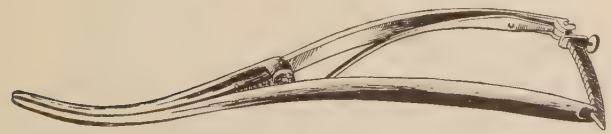


FIG. 21. Author's four branch dilator closed.

cutting edge like a knife-blade, and the metal should have sufficient firmness not to bend too easily. The shaft should have as much rigidity as that of the sharp curette, yet it should be pliable so that the curve may be altered.

The two smaller sizes of the set are often used in the uterine cavity, the larger of the two being used upon the lateral surfaces and the smaller for cleaning out the cornua. The sharp curette is used in the canal of the cervix and for removing the more indurated granulations about

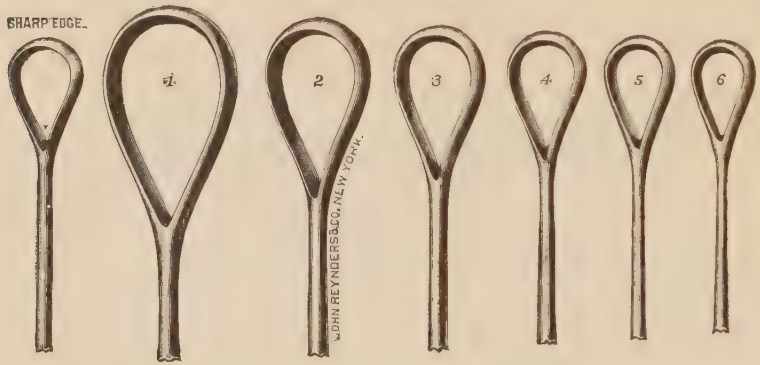


FIG. 22. Author's set of dull and sharp curettes.

the internal os. The larger sizes of the dull curette will be necessary in post-abortum and post-partum cases on account of the large size of the fenestra.

The double current irrigator (Fig. 23) is made in two sizes and is of unusual length, which will be found very necessary in many cases. The larger size is for use at the

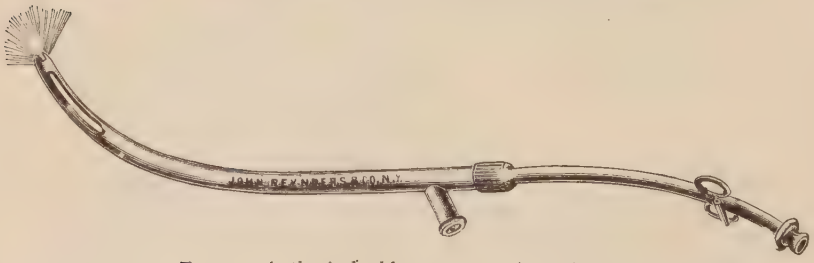


FIG. 23. Author's double current uterine irrigator.

time of the operation when the canal is dilated, and the smaller size, which is designated the clinical irrigator, is for use subsequently, when recontraction has taken place

and the canal is too small to admit readily the operating size. One size will not answer for both purposes, because a larger outflow tube is required at the time of operating to carry off the clots and other debris loosened but not brought away by the curette. Subsequently this larger size is unnecessary, and would require painful dilatation before it could be introduced.

This irrigator possesses many points of advantage over the ordinary instrument of its kind, viz.: (*a*) It is much longer, hence it can be used when the uterine canal is unusually long, as in fibroid and post-partum cases, and in ordinary cases the outflow escapes outside of the vagina; (*b*) the outlet (or outflow) tube is conical, that is, it gradually enlarges from the point to the opening where the outflow escapes, which obviates clogging; (*c*) the inner tube extends up to the point of the instrument which projects the solution against the fundus and all parts of the cavity. If the canal is obstructed at any point by a fibroid in the uterine wall projecting into the cavity, if the point of the instrument penetrates even a short distance beyond the ob-

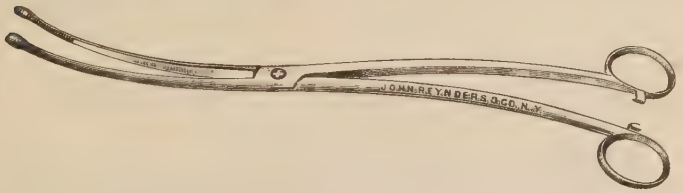


FIG. 24. Uterine packing forceps.

struction, the solution will reach all parts of the cavity beyond. This cannot be accomplished with the instrument having lateral openings near the extremity of the outer tube for the escape of both the inflow and outflow.

The uterine speculum or the endoscope (Fig. 29) will be found useful for inspecting the uterine cavity, particularly in those cases where the canal cannot be dilated sufficiently for digital exploration. The end of the speculum is made slanting, so the orifices of the tubes may be exposed to view as it is turned from side to side. It will be

necessary to use a head mirror or reflector for throwing light into the cavity, and it will also be necessary to keep the blood sponged out of the field by means of a pledget of cotton in the grasp of a pair of long, thin dressing forceps (Fig. 24). Much valuable information may at times be gained by the use of the uterine speculum, and it should be employed more frequently.

Technique of the Operation.—The patient is prepared for the anæsthetic and operation by the administration of a calomel purge (hydrarg. chlor. mite, gr. v, and sodii bicarb., gr. x) the evening before, followed in the morning, if necessary, by a saline cathartic, and the colon is washed out with an enema of warm water. This is done when the condition permits the delay which this preparation requires. The evening before a hot vaginal douche of a one per cent. solution of lysol is given, and the vulva is washed thoroughly with green soap. The vaginal douche is repeated in the morning, and the pudendum is completely shaved, then washed again with green soap, and a pad of sterile gauze or markasol gauze, which is better, is applied, and kept in place by means of a T-binder until the patient is placed on the operating table. The urine is either voided or drawn immediately before the beginning of the anæsthesia.

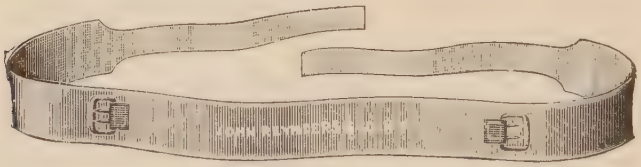


FIG. 25. Author's leg holder.

The patient is placed upon the operating table upon her back, with the buttocks drawn well over the edge, and the thighs are flexed on the abdomen and held in this position with the knees well apart by means of a broad strap or leg-holder (Fig. 25), which passes around the back of the neck, the two ends being fastened around the upper part of the legs near the knees, and tied in the rings, or buckled.

An assistant now proceeds to effect a final cleansing of the vulva and vagina with green soap and a nail brush, irrigating afterwards with a hot one per cent. solution of lysol. For cleansing the vagina a pledget of gauze, in the

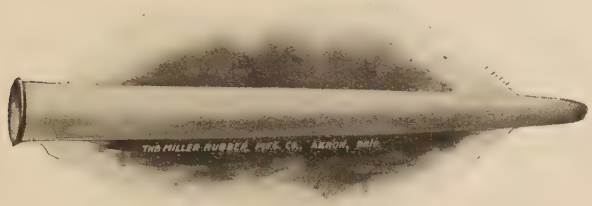


FIG. 26. Author's rubber sponge tent cover for aseptic dilatation of the cervix by means of tents.

grasp of a pair of long dressing forceps, is preferable to the nail brush, which is unnecessarily harsh.

A thorough digital exploration of the pelvis is always to be made at this stage while the patient is deeply anæsthetized, the operator's hands being previously and subsequently sterilized.

FIG 27. Author's sponge tent cover showing tent within, with gauge strip covering it.

A short, broad-bladed, hard rubber perineal retractor is now inserted into the vagina and given to the nurse to hold with her right hand, as she sits to the left of the operator. The cervix is seized on its right side with the angu-

lar tenaculum forceps, which the operator then transfers to his left hand and holds with the middle and index fingers thrust through the rings in the handle, which leaves the thumb free. With this the cervix is steadied and drawn down so as to straighten the canal. The direction of the canal having been previously determined, the dilator is introduced up to its limit before the dilatation is commenced. It is steadied and held into position, so as to prevent it slipping backwards, by the thumb of the left hand, which holds the tenaculum, pressing upon the ratchet spring.

The dilator is grasped in the right hand, and the dilatation is effected by bringing the handles together. This is

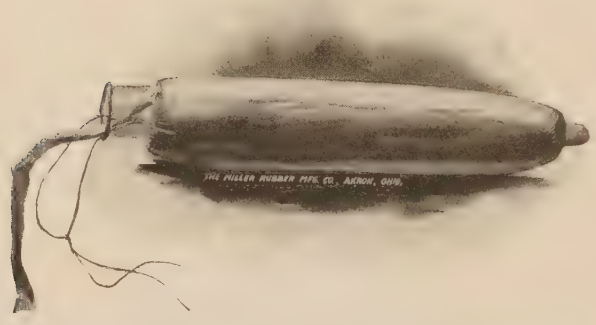


FIG 28. Author's sponge tent cover with laminaria tent within after it has expanded.

done gradually to avoid injury to the walls of the organ. To accomplish this safely a few notches are run up on the ratchet, then the instrument is held still in position for a few moments, and the ratchet is slipped and the pressure is relaxed; then it is run up to the same point again and a few points beyond, left for a few moments and relaxed again, and so on until the requisite degree of dilatation is secured. At times considerable care will be necessary to prevent the dilator slipping backwards and lacerating the cervix, or even penetrating the uterine wall into the peritoneal cavity.

In ordinary cases, where there is no reason to suspect the presence of a growth, or large masses of retained placenta in the uterus, a moderate degree of dilatation will be sufficient, especially if the cervix is rigid and does not yield

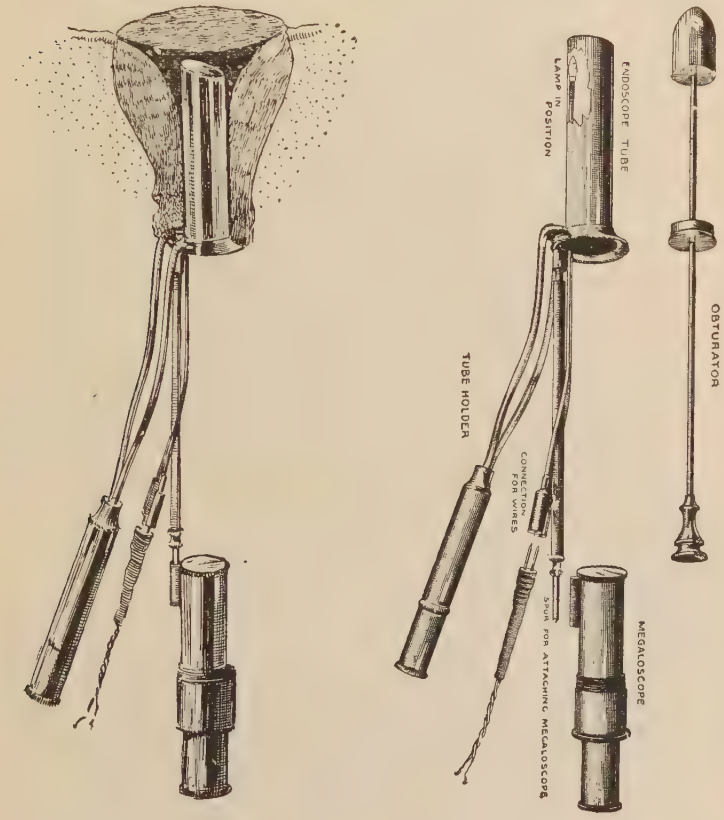


FIG. 29.

Author's uterine endoscope in position. Author's uterine endoscope.

readily, and the steel dilator (Fig. 19) will answer every purpose. If, however, we suspect from the size of the uterus, as ascertained by careful bimanual examination, that there is something in the cavity, the dilatation should

be made sufficient for the introduction of the index finger for the purpose of thorough exploration of the cavity.

When it is necessary to dilate sufficiently to introduce the finger for an exploration of the cavity, a sponge or lam-

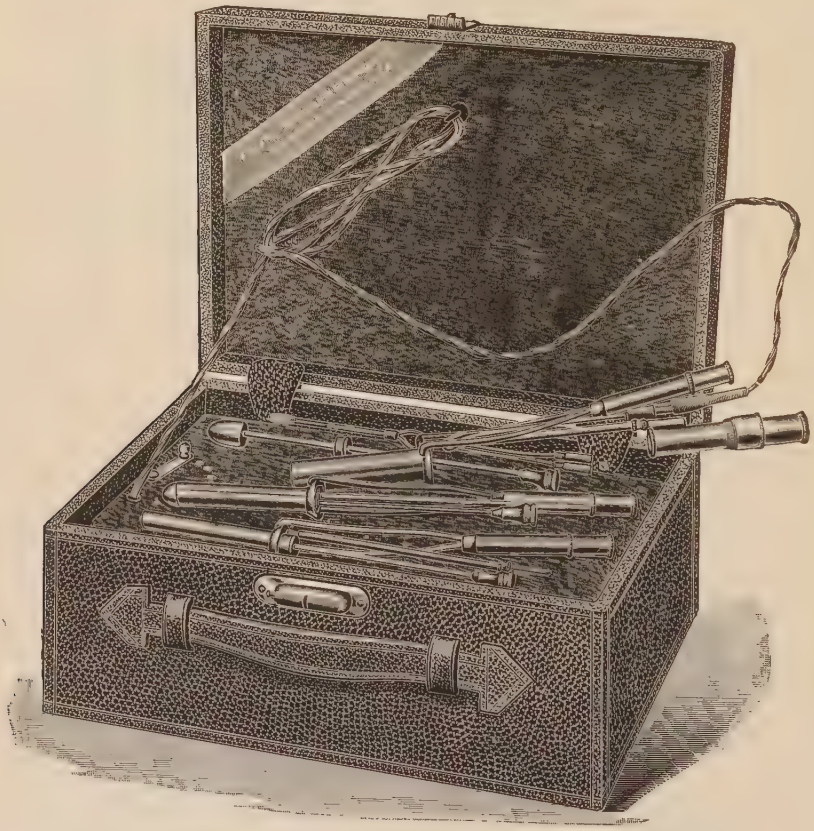


FIG. 30. Author's uterine endoscope complete with case containing four dry cells for illuminating the lamp.

inaria tent should be used to effect dilatation. To make such dilatation aseptically a rubber tent cover or shield is employed, and the tent expanded within this shield without coming in contact with the canal or cavity at any point. (See figures 26, 27, 28.)

A narrow strip of gauze is carried over the end of the tent, as shown in Fig. 26, one end being left longer than the tent. This is dipped into water to wet it, and the rubber shield is drawn over it, leaving the long end of the gauze projecting beyond the mouth of the shield. This is now inserted into the canal to the full length, and the vagina is packed loosely with gauze, which is then made thoroughly wet. The capillary action of the gauze carries the water up with the shield, wetting the tent and causing it to expand. This shield should be previously sterilized by boiling.

Sponge or laminaria tents may be rendered aseptic, yet their use without the rubber shield may cause sepsis by absorbing germ-laden secretion from the cervix, and conveying it up into the cavity of the uterus.

In all cases it is best to insert the uterine endoscope (Fig. 29), and by means of a strong reflector, inspect the interior of the uterus both before and after curetting. In this manner errors may be avoided and more perfect work is assured.

Curettage for Endometritis.

When there has been no extension of the inflammation involving the tubes, the method of procedure is as follows, viz.: After a sufficient degree of dilatation has been effected, the double current irrigator is inserted, and the cavity is thoroughly irrigated with a 1 per cent. solution of lysol, hot, to remove all secretion. In doing this the instrument is inserted up to the fundus, then it is turned from side to side, and then withdrawn a short distance, so as to reach all parts of the cavity. The reservoir for the solution should be placed at least eight or nine feet from the floor, and the tubing leading therefrom should have a large calibre, so as to give more volume and force to the stream.

After this, the second size curette (No. 5, Fig. 22) is inserted into the cavity, and with a firm stroke and downward motion in which there is only just sufficient pressure to remove granulations projecting above the surface, or

unhealthy tissue, the whole surface is gone over thoroughly in the following order, viz.: First, the anterior surface, the shaft of the instrument being previously curved so as to reach all parts readily, the cervix meanwhile being steadied with the angular tenaculum forceps, which draws the whole organ down and straightens out the canal; then the instrument is turned half around and the posterior surface is gone over in like manner, next the lateral surfaces, and finally the fundus. To reach and curette the fundus satisfactorily it will often be necessary to reverse the curve in the shaft of the curette, so as to bring the edge on the concavity. This part of the cavity is often overlooked and neglected by good operators, which is a matter of some surprise. To reach up into the cornua the smallest size curette will be required, and this is used after the other parts of the cavity have been gone over, giving it the necessary curve and turning it in every direction to be sure that the work is thoroughly done. This is important, as it is very necessary to remove all granulations or unhealthy mucous membrane about the orifices of the tubes. Finally, the tough hypertrophied granulations about the internal os, and in the cervical canal will require the sharp steel curette for their removal, and this is used here only after the cavity has been curetted with the dull instrument. The sharp curette is required in this location because the granulations are so firm and tough that the dull curette would slip over them and leave them behind. Their removal is important because they form a barrier to free drainage from the cavity when the canal is closed.

The curettage completed, the large double current irrigator is again inserted and the cavity is thoroughly inundated with the hot lysol solution, which removes clots and particles which have been loosened by the curette and checks the oozing. Sometimes a weak solution of iodine in water (one to two ounces of the compound tincture of iodine to the quart of water) is used afterwards through the irrigator for its astringent action.

In these cases the cavity and canal are left free for drain-

age, which is facilitated by filling the vagina loosely with moist iodoform gauze. This is removed after twenty-four hours and the cavity is again irrigated, but this time with a 1 per cent. solution of markasol, which is mildly astringent and does not produce the least irritation. The patient is kept in bed for a week at least, and during this time the cavity must be irrigated every day to keep the surface clean and free, which promotes healing. The presence in the uterus of clots resulting from the oozing, and shreds of detached tissue, which are only loosened at the time of the operation and are thrown off afterwards, is always a source of irritation which retards healing, particularly if they are not removed before decomposition occurs. Hence the necessity for repeating the irrigations every day of the week following the operation.

The cavity of the uterus is never to be packed with gauze for simple uncomplicated endometritis, except in those cases where it seems necessary for the purpose of prolonged medication, when iodoform gauze, 10 or 20 per cent., has been carefully sterilized, may be used, but it should not be packed in firmly and should under no condition be permitted to remain longer than twenty-four hours, when it should be removed, the cavity irrigated, and then replaced if necessary. The gauze will not drain after it has become completely saturated, and if it is permitted to remain longer in the uterine cavity the secretions are retained above the gauze, and may back up into the tubes and excite inflammation which did not previously exist. The gauze itself is an irritant if left in the uterine cavity too long, saturated with the secretions. In some cases of hæmorrhagic endometritis, after curetting it will be necessary to apply iodine to the surface. It should always be applied through the double current irrigator so the excess may escape through the cavity. It will seldom or never be necessary to use it pure, but it is best applied in the form of a dilute solution in water. If the compound tincture is employed it makes a clear solution on account of the presence of iodide of potassium. The strength of the solu-

tion may vary from half an ounce to one or two ounces to a pint of water.

The subsequent management of these cases after curettage is important and has much to do with the result. Drainage from the cavity is never perfect for any length of time after the operation, whether gauze is or is not used. More or less recontraction of the canal follows in a short time, and if it occurs before the endometrium is completely healed and a normal condition is restored, the secretion will be retained, become decomposed and irritate, thus retarding the healing process. The only way to obviate this is to employ repeated irrigations until a healthy condition of the endometrium has been restored, and it is no longer necessary. This can best be carried out with the clinical irrigator, because it is small enough to be readily introduced, even after the canal is considerably contracted.

During the first week following the operation, while the patient is confined to bed, these irrigations should be repeated every day, and this applies equally if the gauze packing is employed or the canal is left free. For the first day or two a one per cent. solution of lysol is often best, because it acts as a solvent to the secretions and softens and detaches blood clots. After this a one per cent. solution of markasol may be used. This is mildly astringent and a reliable antiseptic, though not in the least irritating, and promotes healing of the abraded mucous membrane. Where iodine irrigations are employed this should be repeated every second day, and when necessary even every day during the first week, but it should always be preceded by a thorough irrigation with the lysol solution to cleanse the surface to which it is to be applied.

When the patient has been permitted to get up and go about it will not be necessary to irrigate so often for two reasons, viz.: The endometrium is by this time in a more healthy condition and does not require it, and the erect position favors drainage. Therefore, during the second week, when the patient is out of bed, the irrigation is repeated only twice or three times at most, and during the

week following this it need be repeated only once or twice. It should be continued only so long as there exists a necessity therefor, as evidenced by the presence of mucous or other form of debris in the return washing. When the washing returns clear the case may be considered well, and not before. The failure of this operation to effect a cure in these cases is most frequently on account of a neglect of proper after-treatment.

FIG. 31. Author's glass tunnelled uterine drainage stem.

A word of caution is necessary here. Irritating antiseptic applications or irrigations should not be continued too long, else an acute inflammation will be provoked. If during the after-treatment of these cases a clear albuminous discharge from the cervix is observed and the os looks swollen and red, all local applications to the interior of the uterus should cease at once, and measures must be adopted to subdue the inflammation of which this is evidence. Throughout the bowels must be kept free and any other cause of pelvic hyperæmia must be promptly removed.

CURETTAGE FOR ENDOMETRITIS ASSOCIATED WITH UTERINE DISPLACEMENTS WHICH ARE REDUCIBLE.

In these cases the operation is done in the same manner as for uncomplicated endometritis, and as already described, but for the purpose of securing efficient drainage and to overcome the displacement a glass drainage tube is employed. This acts as a splint to the dislocated uterus, holding it straight, and making it possible to retain the uterus in a corrected position by means of a vaginal tampon. (See Fig. 31.)

Being made of glass this drainage tube is readily cleansed and sterilized by boiling. After the curettage is completed and the cavity has been irrigated, the drainage

tube is inserted and held in position by a tampon of iodoform or markasol gauze in the vagina, which is so placed as to hold the uterus in proper position. To facilitate its introduction the cervical canal is straightened out by traction upon the cervix downwards with the angular tenaculum forceps.

The drainage tube will furnish free drainage only for a limited time, since it eventually becomes clogged with the thick mucous secretion and small clots from the uterus, and it must therefore be removed at least every day, cleansed and replaced. The cavity is, of course, irrigated each time. It is best to have several of these drainage tubes on hand, and to use a fresh one, previously sterilized, instead of waiting to cleanse and sterilize the one which has been removed.

It is sufficient in most cases to keep the drainage tube in the uterus for a week, removing and replacing it, of course, every day, and during this time the patient should be confined to bed. Then a vaginal pessary is fitted to maintain a correct position of the uterus.

This plan of treatment is effectual for both flexions and versions in overcoming the metritis and endometritis which is so often a maintaining cause of the displacement when the organ is not fixed by adhesions or exudation.

When the uterus is fixed this plan of treatment is contraindicated. It will not always prove successful in movable displacements, and shortening of the round ligaments must sometimes be resorted to, though it will always constitute a valuable auxiliary measure.

Curettage for Chronic Metritis where there is Sclerosis of the Uterine Wall.

Much more difficulty will be encountered in dealing with this class of cases. The granulations with which the endometrium is studded are sometimes very much indurated, and the sharp curette will be required for their removal. In some cases, however, the mucous membrane is perfectly smooth, except at the internal os or in the cervical canal,

and there is nothing to be scraped away from the endometrium.

The curettage is the least important part of the treatment of these cases. The greatest good is to be anticipated from the use of the uterine tampon of iodoform gauze, the object of which is to soften the indurated uterine walls and restore a normal circulation and nutrition. The gauze should be packed in as tightly as possible with the uterine forceps, and it is best to use the 20 per cent. gauze moistened slightly with sterilized glycerine. The gauze, which is a yard wide, is folded lengthwise and placed in a wide mouth bottle, which is securely corked, and then put into a sterilizer. The glycerine is added previously. Strips the width of two fingers are cut crossways of this gauze, unfolded, and placed upon a sterilized towel. The cervix is steadied with the angular tenaculum forceps while one strip is packed in at a time, taking care to press it well up into the cornua and fill every part of the cavity to distention. If one strip does not fill the cavity, the lower end is held in one hand while another is inserted, and so on until the entire cavity and cervical canal are filled, leaving the end of each piece projecting through the cervix into the vagina, which is also filled with the same gauze cut in wider strips. A vulvar pad of the same gauze, and over this several layers of plain gauze, are then applied and held in place by a T bandage.

This first dressing may be permitted to remain for forty-eight hours, when it should be removed, the cavity washed out and fresh gauze inserted. Subsequently for the remainder of the first week it should be removed every day. During this time (the first week) the patient should be confined strictly to bed.

It will be necessary to continue this treatment for several weeks in some cases, though usually two or three weeks will suffice. After the first week, if the discharge from the uterus is not purulent, the dressing may remain in the uterus for two or three days at a time, and the patient should be kept quiet, but she need not necessarily be in bed.

After the uterine packing has been discontinued an occasional application of iodine and glycerine (equal parts) to the interior of the uterus will prove a great benefit. This is introduced through the double current irrigator, and a tampon of plain gauze, one end of which is soaked in plain glycerine, is inserted in the vagina against the cervix. This is removed in twenty-four hours and a copious vaginal douche of hot water is given.

Curettage for Subinvolution of the Uterus.

Here the uterine wall and the mucosa are both unusually soft, and only the dull curette should be employed with the greatest care. The canal is usually patulous and dilatation is easily accomplished, but it must be done carefully. In these cases, when it is possible to effect sufficient dilatation safely, the cavity should be explored with the finger or inspected with the uterine endoscope.

The largest size curette that will enter the canal readily should be used first so as to detach and remove pieces of placental tissue which may be retained. Subsequently a smaller size is employed for going over the surface again and for cleansing out the corners. Drainage in these cases is amply provided for by the patulous condition of the cervical canal, and gauze should not be employed. Not only will no good result from its use, but it may be productive of harm by increasing rather than overcoming the flaccidity of the walls of the organ by the distention which it produces. It is a mistaken idea that packing the uterus will stimulate contraction in these cases.

We may rely more confidently upon a strong astringent stimulating application like iodine. Therefore, following the curettage in these cases, the cavity should be irrigated with a strong solution of iodine (an ounce to two ounces to a pint of hot water). This should be repeated after two or three days as required. From two to five of these irrigations will usually suffice, and the strength of the solution should be lessened as improvement becomes manifest. During this after-treatment the patient should be confined to bed.

The judicious use of vaginal bipolar faradization with the current from the short course wire coil every day will aid very materially in bringing about a rapid cure of these cases. In some cases, however, it will be better to use a smaller electrode and make the application directly to the uterus.

CURETTAGE FOR POST-ABORTUM HEMORRHAGE AND RETAINED PLACENTA.

The dilatation in these cases particularly should be done with care, as the uterine wall is soft and easily penetrated. When possible it should be made sufficient to permit digital exploration of the cavity. Previous to introducing the curette the cavity should be thoroughly irrigated with a one per cent. solution of lysol. The largest size curette should be used first, and afterwards a smaller size if necessary. There is less danger of perforating the uterine wall with the large curette, which should nevertheless be used with the greatest care. Large pieces of retained masses are more easily detached and removed with this than with the smaller instrument. Upon completion of the curettage, a copious irrigation with the lysol solution is necessary to remove small detached masses which are not brought away by the curette. This is followed by free irrigation with a strong solution of iodine (one to two ounces of the compound tincture to a pint of water). Gauze is not inserted either into the uterus or vagina. There will be little or no oozing of blood from the uterus if the curettage is done thoroughly. If there is any conspicuous oozing after twenty-four or forty-eight hours, the application of iodine should be repeated, otherwise the case may be left undisturbed. An occasional irrigation with a one per cent. solution of lysol may be required during convalescence if the discharge shows any debris. The patient should be confined to bed for a week at least, and the temperature must be watched.

Even when the case has been neglected and there is a purulent discharge from the uterus, the method of procedure is the same and the sharp curette should not be used.

CURETTAGE FOR CHRONIC INFLAMMATORY DISEASE OF THE ADNEXA.

The object of curettage in these conditions is to overcome the associated endometritis, which is a constant source of irritation or reinfection, maintaining a chronic inflammatory action or rekindling fresh acute attacks. The subsequent packing of the uterus with gauze favors drainage from the tubes by distending the cavity of the uterus and especially the orifices of the tubes, and by capillary action. The presence of the gauze in the uterus likewise provokes a copious exudation of serum from its walls, which produces depletion and exerts a beneficial influence upon inflammation of adjacent structures.

The details of the operation must be carried out with the greatest care and the strictest asepsis must be observed. The dilatation is effected slowly and gradually to avoid injury or undue irritation, and is made only just sufficient to permit the introduction of the second size curette. Despite the teachings of some operators to the contrary, the sharp curette should not be used; the dull curette will be sufficient to meet all requirements of the procedure. The surface must be gone over carefully but thoroughly, and with a firm touch. The lateral sulci and cornua will afterwards require the smallest size curette, which will also answer for the fundus.

The sharp curette is used only for removing the granulations about the internal os after curettage of the cavity has been completed with the dull instrument. Copious irrigation with a hot one per cent. solution of lysol should follow. Then the uterine speculum may be introduced and the cavity, especially about the orifices of the tubes, inspected to ascertain if the work has been made thorough. Next, the cavity is packed firmly with gauze. This may be done through the uterine speculum, withdrawing it gradually as the cavity is filled, or this may be removed and the gauze inserted in the usual manner with the long uterine dressing forceps.

Especial care is taken to press the gauze firmly up into each cornu and fill every part of the cavity and the cervical canal, permitting the lower end to hang out into the vagina, which is also filled afterwards with gauze. Sterilized iodoform gauze (10 or 20 per cent.) moistened slightly with glycerine is to be preferred.*

This dressing should never be permitted to remain longer than twenty-four hours, for by this time it has become saturated and ceases to act as a drain. Its presence beyond this period is apt to be productive of harm, inasmuch as secretions may collect above it and back up into the tubes. The writer has often noted the escape of a quantity of purulent secretions upon removal of the gauze when retained for a longer time than twenty-four hours. Presumably, this has escaped from the tubes and was not taken up by the gauze.

The gauze packing should, therefore, be removed every twenty-four hours, the cavity irrigated freely, and then fresh gauze inserted. It will usually suffice to continue this for a week, and the patient must, of course, be confined to bed.

The subsequent management of the case will be suggested by the condition which remains. If irrigation is necessary afterwards, it must invariably be done at the patient's house, and she must rest quietly in bed for at least twenty-four hours after. Hot vaginal douches every day with applications of iodine to the vaginal vault or a loose vaginal tampon of plain gauze or markasol gauze, moistened with glycerine, will aid materially in stimulating absorption of inflammatory deposits and in bringing about resolution.

The judicious use of bipolar faradization of the vagina with the current from the long, fine wire coil, every day, is of incalculable value, both for relieving the pain and pelvic hyperæmia and for promoting rapid absorption of inflammatory exudates.

*The glycerine is added to the gauze before it is sterilized.

Curettage of the Fibroid Uterus.

Curettage is utilized in these cases, not as a curative measure, but mainly for the purpose of controlling hemorrhage, which is often persistent and exhausting, and likewise as an auxiliary measure to less radical operations than hysterectomy, such as myomectomy and division of the uterine arteries. When done for the control of hemorrhage, it is to be regarded as a temporary expedient only, since the diseased mucous membrane is rapidly reproduced, and, the cause remaining, the hemorrhage will sooner or later recur; but when done as an auxiliary to the operations mentioned, it is productive of permanent benefit, inasmuch as it overcomes the associated endometritis. The condition presents many difficulties which may be overcome by patience and care, coupled with a thorough understanding of the situation. The uterine cavity is apt to be irregular in consequence of projecting tumors and nodules, and there may be pockets or sulci which escape the curette unless the greatest care is taken. Exploration of the cavity with the sound to ascertain its depth and direction, is a necessary preliminary step to the introduction of the curette. It will be necessary, however, to exercise great care in using both the sound and the curette to avoid penetrating the uterine wall, which is often very thin and very much softened.

Dilatation of the canal of the cervix will at times involve some difficulty, both because of tumors situated in the wall of the cervix or encroaching upon it and because of the increased length of the canal. The ordinary dilator will, therefore, not be sufficient in all cases, and a special dilator with extra long blades will be required, or the graduated bougies may be used.

Upon completion of the dilatation, which should be as thorough as possible, consistent with safety, the irrigator is introduced and the cavity cleansed with a two per cent. solution of lysol. (The advantage of the long double current irrigator will be quite apparent here.) The dull curette will be all-sufficient in these cases, because the mucous membrane is much thickened, unusually soft, and easily re-

moved. It is best to use a medium size always, as it is less liable to perforate the wall. The greatest care will even then be necessary, particularly in cleaning out pockets, and the patient must be kept deeply anæsthetized to avoid straining, coughing, or vomiting, which might render this accident otherwise unavoidable. It will be necessary to scrape away every portion of the diseased tissue which can be reached, and in these cases the membrane is to be literally and entirely removed. Profuse bleeding may follow at times, but this is readily controlled by the application, through the double current irrigator, of the compound tincture of iodine, either pure or diluted with water.

Following the curettage in all of these cases, even when hemorrhage is not provoked, the cavity should be irrigated with a solution of iodine, from an ounce to two ounces to a quart of water. The irrigator is first introduced as far as it will go, up to the extremity of the cavity if possible, then turned from side to side while the flow continues, and towards the end of the irrigation it is gradually withdrawn, so that every part of the cavity is reached by the solution. Sometimes, especially when there are dilated cavities or pockets beyond constricted portions of the canal, it may be necessary to stop the outflow outlet with the finger and distend the cavity carefully with the solution to make it come in contact with all parts of the surface.

When the operation is done for hemorrhage it may be necessary to repeat the iodine irrigation during convalescence. Its benefit is temporary in these cases for two reasons, viz.: first, on account of the irregularity of the cavity it is sometimes an absolute impossibility to remove completely all the diseased membrane, and, second, because the endometrium is rapidly reproduced and the causes which occasioned the diseased condition in the first instance still exist and have not been removed.

CHAPTER VI.

TRACHELORRHAPHY (REPAIR OF LACERATED CERVIX).

One of the most essential things for the success of this operation is a proper preparation of the parts involved. The best executed operative technique will result in failure if this is neglected. Union might take place between the approximated lips of the cervix if they were properly denuded and the sutures were not removed too early, but the result anticipated upon the diseased uterus would be an absolute failure.

When the laceration is of long standing, the cervical structure becomes very much hardened, and the Nabothian glands become distended with pent up secretion. These

FIG. 32. Author's trachelorrhaphy knives, two sizes, having double cutting edge.

distended glands are sometimes situated near the surface, and sometimes they are very deep seated. Sometimes they suppurate, forming comparatively large cavities, which, if opened during the operation, produce infection and prevent union. In some cases the whole cervix and the canal is a granulating surface, entirely devoid of epithelium, there being marked congestion with infiltration of the submucous structure. These conditions must be overcome before the operation is attempted, and it will require from two to four weeks for the preparatory treatment. This will consist of scarification of the cervix, puncture of all distended glands which are noticeable, and, after free bleed-

ing, the insertion of a glycerine or boro-glyceride tampon against the cervix. The best tampon for this purpose is a strip of gauze, two and a half inches wide and a yard long, with a string attached to one end to withdraw it. This can be packed around the cervix so as to surround it completely,

FIG. 33. Author's scissors for removing sutures.

and secures the greatest possible amount of depletion, with the least irritation from pressure. After twelve or eighteen hours this tampon is removed, and a copious vaginal douche, as hot as can be borne, is used twice a day until the tampon is reinserted. The patient should be directed to hold the labia together and distend the vagina repeatedly during

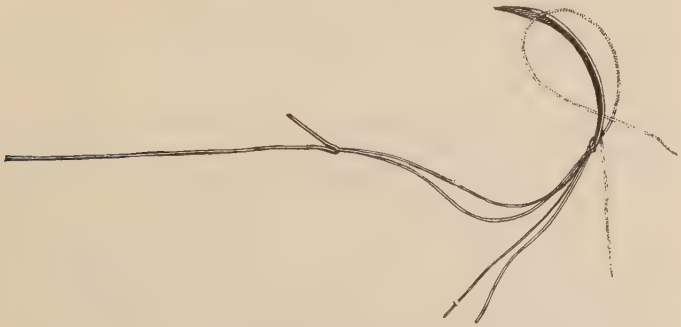


FIG. 34. Showing method of threading needle with carrying thread and method of securing it from slipping by looping one free end over needle, also manner of attaching wire suture to carrying thread.

the irrigation, removing the hand and permitting the accumulation in the vagina to gush out as soon as it is completely distended. This manœuvre, properly carried out, brings the hot water in contact with every part of the vagi-

nal vault, and by lifting the uterus, favors greatly the emptying of the overloaded bloodvessels and obstructed lymphatics. This is the only way a vaginal irrigation can be made effective with the fountain syringe. The scarification is repeated and a fresh tampon inserted every second or third day, and this is continued until the congestion has been removed, all the distended glands have been evacuated, the remaining cavities have healed, and the cervical tissue has become softened.

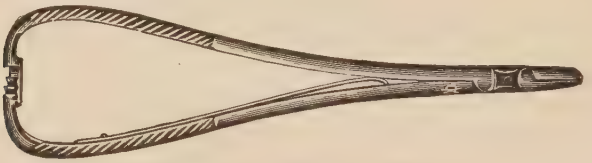


Fig. 35. Long handle needle forceps.

Fig. 36. Tenaculum for cervix.

Fig. 37. Counter pressure hook.

Fig. 38. Wire twisting forceps.

Granulations upon the surface of the cervix and in the cervical canal must be removed once thoroughly with the sharp curette; then the surface is stimulated to promote the formation of healthy mucous membrane by covering it with dry markasol applied by means of an insufflator. In these cases, the vaginal douche should be a hot one per cent. solution of markasol.

Silver wire is so far superior to all other suture material for the cervix, that no other should ever be used. Its advantages are, viz.:

1. It permits more accurate coaptation.

2. It holds the approximated surfaces constantly in contact, so long as the suture is left in position.

3. The tension of the sutures can be perfectly adjusted, and can be altered at any time.

4. When correctly adjusted and properly shouldered, the suture acts as a splint to the approximated lips of the cervix, because it moulds itself to the angles of the suture track and retains the shape as first adjusted until it is removed.

5. If it cuts into the tissue, in consequence of the increased tension due to œdema following the operation, the tissue heals over it and it becomes buried.

6. It remains stationary and does not irritate.

7. The oxidation of the surface inhibits germ growth and suppuration of the suture track does not occur.

8. It may be left in indefinitely without detriment.

The disadvantages of other suture materials—silkworm gut and cagut, either plain or chromicized—are in proportion to the advantages of silver wire. Silkworm gut cannot be tied so as to approximate the surfaces accurately and evenly, one suture being tight and the other loose. It cuts into the tissue and does not become buried, and it irritates. This is chiefly due to the fact that the suture loop is not stationary, but moves with every deep inspiration or cough, because the free ends of the suture catch in the vaginal wall and do not lay down on the surface of the cervix as does the twisted end of the silver wire suture. The suture loop is round, and not angular, as the suture track is. It irritates, and must be removed early.

The same objections apply to chromicized catgut, and the plain absorbs too quickly. Sutures of either are unreliable, because the loop loosens as it cuts into the tissue, and permits the approximated lips to separate. Catgut suture is open to the additional objection that it will absorb septic discharges, hence the suture track may, and often does, become infected in consequence.

The sutures must be prepared beforehand, the wire be-

ing rendered sterile, then cut into lengths of about six inches, one end being bent over at a very acute angle about a third of an inch from the end to attach to the loop of the carrying thread. No. 25 or 26 wire is the proper size. Eight of these sutures should be prepared, though it is seldom necessary to use more than six or seven. They are placed lengthwise in a dish containing a solution of carbolic acid about 1 to 20.

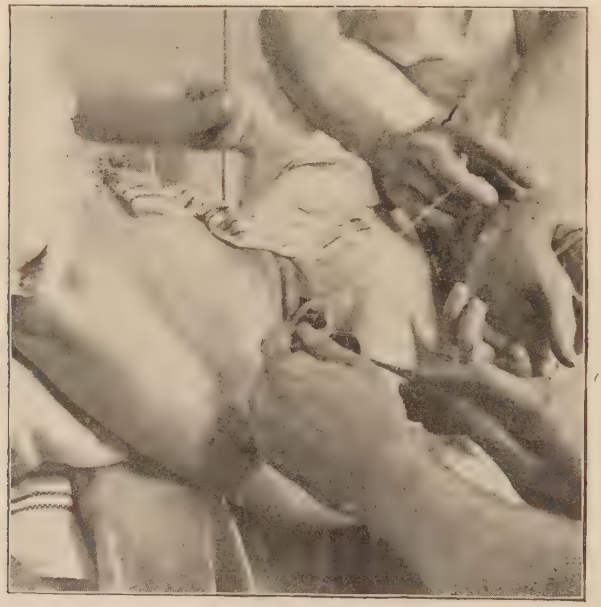


FIG. 39. Showing traction ligatures. The uterus is drawn down unusually far.

The sutures are inserted by means of a strong quarter curved needle about an inch and a half long, with a long point, ground upon three sides. It has been found that this needle penetrates the dense cervical tissue much more readily than any other. A carrying thread is attached to the needle for receiving the silver wire suture, which is hooked

into its loop when everything is in readiness for its insertion. To attach the carrying thread securely to the needle, both ends are threaded into the eye in the same direction, leaving a loop about four inches long. Then one of the free ends is looped once around the needle in the same

FIG. 40. Showing insertion of tenaculum and knife in the angle of the laceration, with nurse holding perineal retractor, and the position of the patient.

manner as the yarn is attached to a knitting needle, in beginning work, and it is drawn down over the eye of the needle, the needle passing completely through this loop which is drawn tight, close to the needle. This secures the thread and it will not slip out. The free ends are cut off

about half the length of the loop. Stout linen thread, which has been sterilized, makes the best carrying thread.

Immediate Preparation of the Patient.—The pudendum is shaved carefully and scrubbed with green soap, and the vagina is thoroughly irrigated with a one per cent. solution of lysol the evening before the operation. Then an antiseptic pad is applied against the vulva. The next morning another vaginal douche is given and a fresh pad is applied. The patient is placed upon the operating table upon the back, with the buttocks well drawn over the edge, and the legs are secured by a leg-holder, which flexes the thighs upon the abdomen.

Some operators still prefer the Sim's position, but the dorsal posture as here described (Fig. 39) will be found to be much more convenient, and it facilitates rapid work.

An assistant now proceeds to give the vulva and vagina a final cleansing by scrubbing the former with brush and green soap, and washing it off with a one per cent. solution of lysol, and the vagina with a pledget of cotton held in the grasp of a long-handled dressing forceps. This should be done by an assistant who is not to participate otherwise in the operation, or, if his or her services are required, the hands should be resterilized.

Technique of the Operation.—A short, broad-bladed perineal retractor is now inserted into the vagina and given to the nurse to hold, who either stands or sits to the left of the operator. For some reasons it is preferable for the nurse to stand, as she can then use her disengaged hand to aid the operator, and she is less in the way.

The operator seizes the anterior and posterior lips of the cervix in the centre, each with a separate tenaculum, and passes through each, above the tenaculum, a traction ligature of silk or linen thread which has been rendered sterile. The ends of each ligature are tied together, forming a loop which puts the cervix under the control of the operator (See Fig. 39). One of these loops, that attached to the posterior lip, is slipped over one finger of the hand of the nurse holding the perineal retractor, and the other she holds with the other hand above the pubis.

The operator now proceeds to dilate the cervix carefully, and curette the cavity of the uterus thoroughly with the semi-sharp curette (as described under the head of Curettage of the Uterus). This done, and the cavity irrigated, he proceeds with the main operation in hand (trachelorrhaphy). This curettage is a most important preliminary step and should never be omitted.

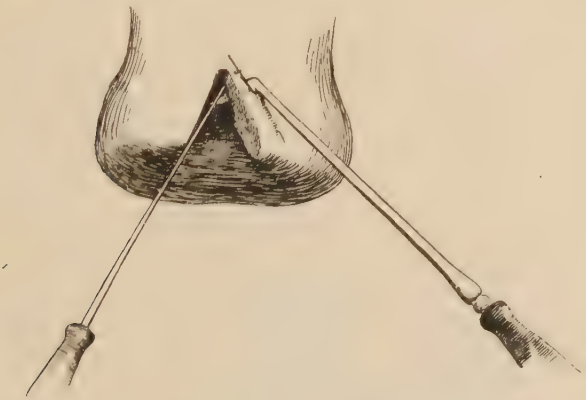


FIG. 41. Showing first step of the denudation with tenaculum fixed in the angle and the knife inserted.

The first assistant, standing to the left of the operating table, facing the operator and bending over so as to be able to get a good view of the cervix, must be ready with stick sponges to remove the blood quickly from the field of operation when denudation of the lips of the cervix is completed on one side.

The operator selects the posterior lip for denuding first, for then the blood does not obstruct the field of the other lip, and the left side is usually done first as a matter of convenience. Inserting a stout tenaculum into the so-called cicatricial plug at the angle of the laceration from within, out (as shown in Figs. 40 and 41), he inserts the knife (Fig. 32) some distance above from without, inwards, deep enough to penetrate the whole thickness of the cervical wall so that its point emerges in the canal. Steadying the cervix

with the tenaculum, the knife is drawn downwards, cutting through the hard tissue at the angle, as shown in Fig. 41. When this much is accomplished the tenaculum is removed from the angle and inserted in the cervical lip at the extreme lower margin, as shown in Fig. 42. The object of this is to steady the lip so that the line of denudation will terminate at the proper point and will be accomplished neatly with one stroke of the knife. The knife is now drawn down to the point of insertion of the tenaculum, and the denudation of the posterior lip of the left side is completed. The tenaculum is now reinserted at the angle, and in a similar manner the knife is inserted above at the point where it first penetrated, and, directing the edge upward, the anterior lip is denuded in a similar manner. If

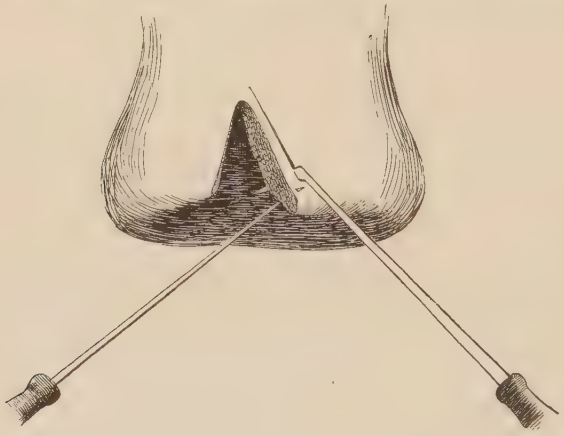


Fig. 42. Showing tenaculum fixed in the margin of the cervical lip, and the knife making final cut to denude the posterior lip.

now the tissue to be removed remains attached at the extremity of the angle, it is quickly detached by a few upward strokes of the knife, which has a double cutting edge.

In making the denudation it is very important to hold the knife in such a manner as to remove a strip of tissue which is thicker on the inner, or canal, side and thinner on the outer, or vaginal, side of the cervix, so that a ridge of

tissue be not left on the inner edge of the denuded area which would act as a wedge when the lips are brought together and prevent neat coaptation, and interfere with union by putting too much strain on the sutures. If the denudation is carefully done, it is completed with one stroke of the knife for each lip, and no trimming off will be necessary afterwards, as is always required when scissors are employed, since they never cut where you wish them to.

The same thing is repeated on the right side of the cervix, and after thorough irrigation, to wash away the blood, the sutures are inserted.

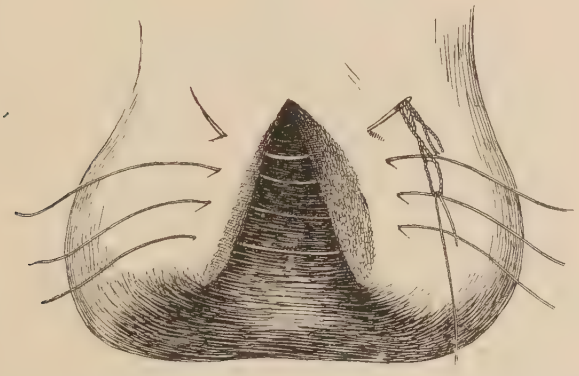


FIG. 43. Showing method of inserting the sutures from below upwards, and the suture attached to loop of carrying thread.

Some operators adhere to their first teaching and still use the scissors for denuding, but the writer is confident if they will at once use the knife for this purpose its advantages will be so apparent they will never afterwards employ scissors.

Contrary to all previous teaching, I always insert the lower suture first, instead of that at the angle, unless free bleeding occurs in consequence of dividing the circular artery. In that case, the suture at the angle may be inserted first, but the others are inserted from below up, be-

ginning at the margin of the cervical lips. This is done so as to approximate more neatly and accurately the margins of the cervix and newly formed os externum, thus insuring more prompt union, with a better result and a cervix of normal contour.

In inserting the sutures the needle must be introduced from without, inwards, upon the posterior lip of the cervix, entering upon the vaginal surface and emerging upon the strip of mucous membrane which has been left undenuded for the new cervical canal, and not upon the denuded area (See Fig. 43); then the carrying thread is drawn through and the needle is inserted through the anterior lip from within the canal outward, entering upon the undenuded surface of the canal and emerging upon the vaginal surface of the cervix. (The needle should never be passed through both lips at once.) The carrying thread being thus passed through both lips, the silver wire suture is drawn through by a rapid movement or jerk, which prevents it from catching at any point of the suture track. But it will be necessary to secure the free end of the silver suture by clamping it with a pair of hemostatic forceps to prevent it from being drawn all the way through. The suture is then detached from the carrying thread and both ends are secured together in the grasp of the same forceps until all the sutures have been inserted, for none are twisted until all have been inserted on both sides.

Before twisting the sutures it is important to clear the angles and denuded surfaces of clots, which can best be accomplished by free irrigation with hot lysol solution, the same as was used for washing out the uterine cavity after curetting.

In twisting the sutures both ends are caught with the wire twister about an inch from the cervix and the free ends cut off short near the twister. The suture loop is now drawn tight and with the tenaculum each strand of the wire is bent toward the other, close to the surface of the cervix, which is called shouldering the suture. Both strands of the suture are now caught upon the bend of the

tenaculum, which is pressed down firmly against the surface of the cervix, while the suture is tightened and bent at an angle upon the tenaculum, as shown in Fig. 44. The ends are now twisted down to the point where they are caught upon the tenaculum. The object of this is to hold the lips together accurately while the suture is being twisted, and to avoid twisting it too tightly. Finally the

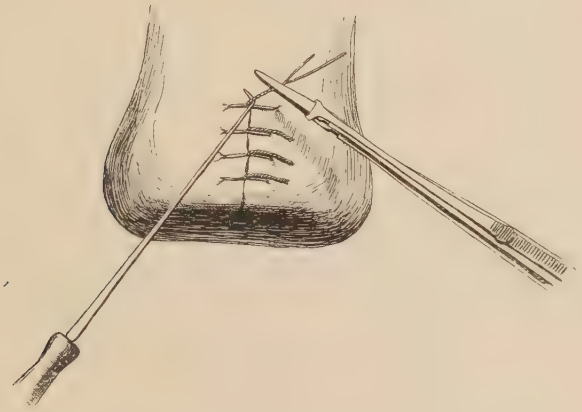


FIG. 44. Showing method of shouldering the suture and of twisting the ends, and their position on the cervix after completion of the operation.

twisted end is bent down flat upon the surface of the cervix, and cut off where it is grasped by the twister.

If one suture happens to be twisted too tightly it may be loosened by inserting a tenaculum under the loop on each side and drawing them apart, thus stretching the loop. From three to four sutures on each side are sufficient, and if they have been inserted properly, they should secure perfect coaptation without intermediate, superficial sutures, which are sometimes used by bungling operators.

When all the sutures have been twisted, a small double-current irrigator is introduced through the newly formed cervical canal into the uterus to ascertain if the calibre of the canal is pervious, and to wash away the blood which has accumulated in the uterus since the curetting.

The cervix is dusted freely with dry markasol, but no other dressing is applied, and vaginal douching is not employed subsequently, unless there is discharge with odor, when a solution of markasol or permanganate of potash may be used.

The patient is confined to bed for at least ten days.

The parts are left undisturbed for two weeks, when the sutures may be removed. I believe it is always best not to remove them before. By that time union is firm and there will be no gaping of the lips.

To remove the sutures, the scissors (Fig. 33) with a dull point on one blade is used. The speculum is inserted with the patient in the Sim's position (left lateral semi-prone), and grasping the twisted end of the suture with a pair of dressing forceps, it is drawn down until part of the loop is exposed. The point of the scissors blade is inserted under this and the blades are closed, severing the loop. A quick jerk with the dressing forceps brings the suture away without giving pain. No after-dressing will be required.

CHAPTER VII.

PERINEORRHAPHY (RESTORATION OF THE FEMALE PERINEUM).

The chief aim of this operation is to restore a natural and serviceable perineum, and to overcome the rectocele. It is one of the most difficult operations in gynecological surgery to understand and do well, yet it is simple and the result is gratifying if the method is well chosen and it is properly executed. Practical results and not theoretical vagaries should influence our selection of the method of procedure. Many different operations have been devised, some good and some bad. The operations described here have given me the best results. They fulfil all the indications and are always successful when properly executed in every detail.

Preparation for the Operation.—The general preparation of the patient is completed on the previous evening, and consists of thorough evacuation of the bowels and cleansing of the vagina by antiseptic irrigation with a one per cent. solution of lysol. It (the vagina) is then filled loosely with markasol gauze. This serves the purpose of absorbing anything which may have collected in the recesses of the vagina and is not removed by the irrigation, and it protects the surface from discharge from the uterus. The following morning the lower bowel is washed out repeatedly by copious irrigation and the gauze is removed from the vagina. The pudendum and vulva are then shaved and washed thoroughly with brush and green soap, and the vagina is again irrigated with a hot one per cent. solution of lysol.

The patient is placed on the operating table in the dorsal position with buttocks well down over the edge of the table, which is protected with a rubber pad. The thighs are flexed upon the abdomen and held in position by a strap which passes around the back of neck, as described under the head of curettage of the uterus.

An assistant next proceeds to give the vulva and surrounding surfaces a final scrubbing with brush and green soap, and afterwards the vagina is scrubbed thoroughly with green soap and a pledget of cotton or gauze in the grasp of a long handled dressing forceps. Finally the vagina and vulva receive a thorough irrigation with the hot lysol solution to wash away the soap.

FIG. 45. Seizing forceps

FIG. 46. Needle forceps.

FIG. 47. Curved sharp pointed scissors.

Technique of the Operation.—Denudation.—The first step is to outline the limit of denudation necessary to overcome the relaxation of the vaginal outlet, and the prolapse of the posterior vaginal wall or rectocele. Sitting at a convenient relative height to the table upon which the patient is placed, the operator seizes the margin of the vulva on each side with a tenaculum at the level of the caruncula or remains of hymenal ring, and approximates them to determine accurately the degree of narrowing necessary to restore a normal size vulva orifice. This decided, a traction ligature is

inserted through each lip just above the point where the denudation is to terminate on each side of the vulva margin (See Fig. 48). These traction ligatures are inserted rather deeply to prevent tearing out. Traction is now made upon these ligatures and the labia are separated widely, putting the perineal margin upon the stretch, and making it almost a straight line from the site of one traction ligature to the

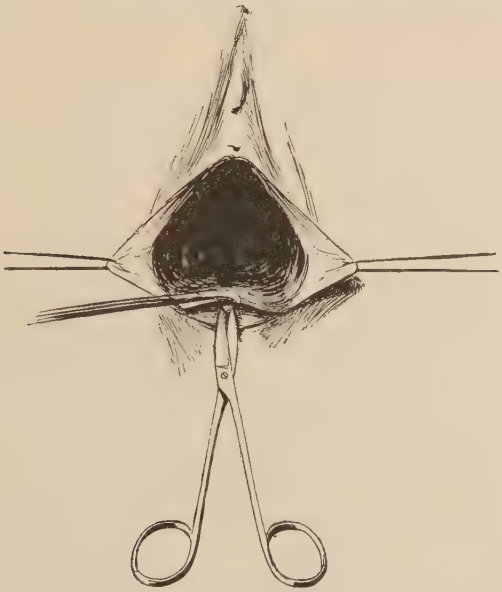


FIG. 48. Showing insertion of tenaculum at apex of the rectocele and the traction ligatures on lateral margin of the vulva, also the method of denudation by dissecting up a vaginal flap from below by means of scissors inserted under the vaginal mucous membrane into the recto-vaginal space. The shading shows the outline of the triangle referred to in the text, the lighter area in the center denoting the portion to be removed. The dark line extending from one traction ligature to the other represents the denuded margin of the vulva made prior to dissecting up the flap.

other. A tenaculum is then inserted well back on the posterior vaginal wall in the median line at about the centre, or so-called apex, of the rectocele. Drawing upon this upward, in the direction of the pubes, a triangle is formed with its apex at the point of insertion of the tenaculum and the other angles at the points of insertion of the traction ligatures on

each side of the vulva. The base of this triangle is formed by the stretched out perineal margin between the traction ligatures. The mucous membrane included within this triangle is the surface to be denuded. With an aniline pencil the sides of the triangle, from the traction ligature on each side to the apex where the tenaculum is inserted, are marked out on the vaginal surface. If now the tenaculum is pushed downward and inward upon the rectum so as to fold in this triangular space, and at the same time the traction ligatures are drawn together until the labia are approximated, it can readily be seen whether or not the tissues will come together without undue strain upon the sutures when the denudation has been done, and if a normal perineum will be the result. This observation will enable the operator to decide whether the denudation, upon the vaginal surface, shall extend quite up to the limit marked out by the aniline pencil or come within it, and will greatly facilitate accurate work.

The next step is denudation of this triangular space. The labia are again separated by traction on the ligatures until the perineal margin between them is put upon the stretch. Catching this margin just below the traction ligature on the left with a pair of mouse-toothed tissue or thumb forceps, a narrow strip of tissue is removed with curved scissors along the base of the triangle, terminating at a point just below the traction ligature on the right which will be opposite the point on the left where the denudation was begun. The inner or vaginal margin of this base line is now rapidly detached with a pair of sharp-pointed curved scissors, and peeled back all along from one traction ligature to the other. Then seizing it in the centre with the tissue forceps, the scissors, with the concave surface up, is inserted closed under the vaginal mucous membrane into the tissue of the recto-vaginal septum, the blades are separated, and they are withdrawn open. (See Fig. 48.) This separates the vaginal wall from the rectum for a considerable space. It is important to hug the vaginal wall in making the dissection so as to avoid wounding or weakening the rectal wall. The subsequent dissection is continued either with the fingers

or the scissors, the rapidity and ease of the work depending upon the extent of the cicatricial tissue. Sometimes the vaginal wall is free and the detachment can be rapidly accomplished with the fingers, then again the scissors will be required throughout. The detachment is extended until the apex and sides of the triangle, as marked by the aniline tracing, have been reached. This flap, composed entirely of vaginal mucous membrane, is now removed with the scissors, following the line from the traction ligature on each side to the apex where the tenaculum is inserted.

The denudation is now complete, and it has been accomplished quickly and in the most perfect manner possible. The surface is irrigated freely with hot normal salt solution to check the bleeding, which at times is quite free. Bleeding points are clamped with hemostatic forceps and twisted, not tied, because it is undesirable to leave knots in the wound, and because the bleeding is always controlled by the suture for closing the wound.

Introduction of the Suture Closing the Wound.—The accurate coaptation of this denuded surface by suture is the next, and a most important, step of the operation. This is accomplished with a continuous suture of fine (No. 1) chromicized catgut introduced in tiers or layers, each layer burying that beneath it, the sutures being so placed as to accurately approximate the opposite sides of the denuded area without leaving any space where blood or serum may collect and prevent union. The gut must be chromicized to last for two weeks at least. Only one strand is employed throughout and only two knots are tied—at the start and at the finish—and they are outside of the approximated surfaces. One knot is made on the vaginal surface at the apex, and the other on the perineum at the lower extremity of the newly formed raphe. A small, short, curved needle (one inch long), with sharp, long point, ground on three sides, is used, and the suture is threaded directly into the needle. The suture is prevented from slipping out by making a slip knot with the free end over the needle. A needle forceps is used for inserting the needle.

Drawing upon the tenaculum inserted at the apex, the posterior vaginal wall is pulled upwards and outwards, bringing the field of operation nearer the vulva orifice and within easy access of the operator. This manœuvre likewise approximates the edges of the vagina or sides of the triangle near the apex and facilitates the introduction of the suture

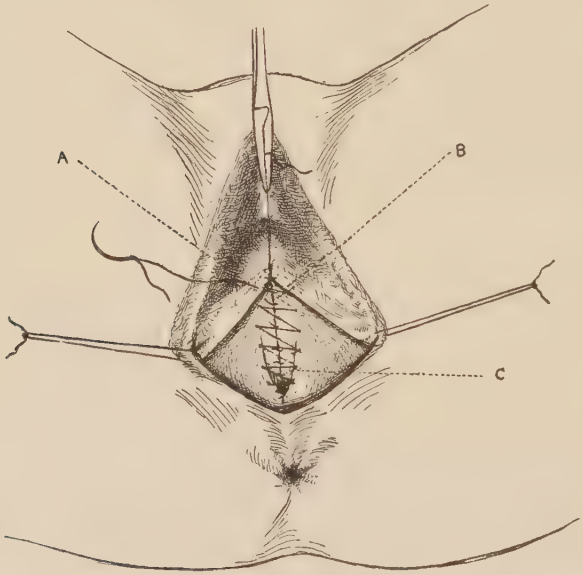


FIG. 49. Showing the method of introducing the continuous suture to approximate the sides of the denuded area. The first insertion of the suture including both vaginal margins at the apex is tied, and the free end is shown grasped by hemostatic forceps. The first tier of sutures has been introduced and tightened as shown by the line down the centre with fine cross lines representing exposed portion of the suture loops. The second tier is shown loose before it is tightened. C represents the first insertion of the second tier of sutures on the way back to the apex. When this point is reached the suture is made to emerge upon the vaginal surface, as shown at the point marked A. Its next insertion is upon the left vaginal margin at the point marked B, coming out again on the denuded area.

at the start. The needle is first inserted through both margins of the vaginal wall near the apex from left to right, the suture is drawn through to within three inches of the end and tied. (See Fig. 49.) The tenaculum is now removed, and the free end of the suture is clamped with a pair of hemostatic forceps and given to an assistant to hold. By

maintaining traction thereon, as with the tenaculum, the field of operation is lifted out of the vagina, and if the traction ligatures inserted upon the margin of the vulva are drawn upon at the same time, the denuded area is spread out and the introduction of the sutures upon this surface is greatly facilitated. With the introduction of each layer of sutures upon the denuded area the traction upon the ligatures is relaxed, so as to permit the lateral surfaces to come together.

The next insertion of the needle is made an eighth of an inch from the vaginal margin on the left and the same distance below its first insertion. (Fig. 49 B.) This penetrates the vaginal wall and comes out on the denuded area a little to the left of the median line, then it is inserted again to the right of the median line, which is omitted, coming out on the denuded area, and does not penetrate the vaginal wall on the right. When this suture is tightened it will fold in the base or median line at the point of insertion (see Fig. 49). The needle is next inserted upon the denuded surface just to the left of the median line, an eighth of an inch below the other,including only just enough tissue to hold, skips the median line and is inserted next upon the right at a point opposite. This method of suture is continued down the centre of the denuded area, folding it in as the suture is tightened. When the perineal margin is reached the suture is not brought out on the skin surface, but is continued again up to the apex, catching on each side the tissue of the denuded area a little to the outer side of the first row (Fig. 49 C). When this row of sutures is tightened more of the denuded surface is drawn together, and the first row of sutures is covered over and buried out of sight. When the upper angle is reached the needle is passed from the denuded surface through and out on to the vaginal surface near the right margin. This brings the suture out on the vaginal surface again. (Fig. 49 A). Its next insertion is upon the vaginal surface on the left, an eighth of an inch below the other, and it is brought out again on the denuded area. If there now remains sufficient denuded area not united to permit the insertion of another tier of sutures down and another back, they

are inserted in the same manner as the first two tiers. If there is not sufficient surface remaining to accommodate the two tiers, the margins of the vagina or the remaining sides of the triangle are united by an over-and-over continuous suture up to the margin of the vulva. In introducing this suture care must be taken to include in each turn the whole of the denuded space on each side between the vaginal margin and the last tier of sutures down the centre, so as to avoid leaving a space between the united vaginal margins and the centre of the denuded area where the other rows of sutures are buried. To accomplish accurate coaptation, which is most essential, it will often be necessary in the course of uniting the vaginal margins to take several sutures upon the denuded area from side to side in different places, then bring the suture out on the vaginal surface again, and go on uniting the vaginal margins, using the same suture always. (See Fig. 50 at points marked H). The traction upon the ligatures attached to the margins of the vulva is relaxed as the closing suture approaches the vulva orifice. At this point great pains is taken to approximate the denuded surfaces at the vulva, so as to construct a normal vulva orifice and posterior commissure. When the suture reaches this point the perineum is virtually completely restored, as there remains only the skin margin of the perineum to be united. Before this is done the free end of the suture at the apex in the vagina, which was held in the grasp of the forceps, is cut short, allowing the vaginal wall to drop back into position. The suture is then continued down the median line of the perineum, uniting the skin margins, and it is tied securely and the ends cut short half an inch from the knot when the bottom of the perineal wound is reached.

This is the most satisfactory and most perfect method of restoring the perineum when time is not a consideration, in that it restores a natural perineum, and when the coaptation has been neatly done and union has taken place, there remains no evidence that there had ever been an injury. The insertion of the sutures consumes considerable time, but the denudation can be quickly accomplished.

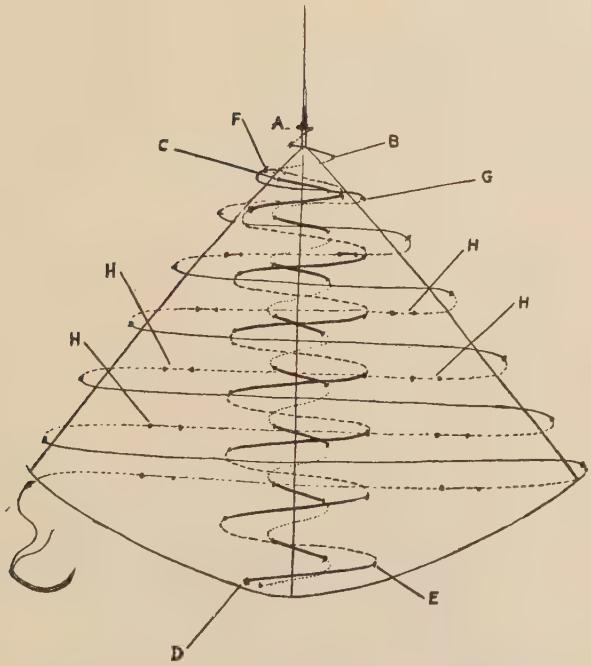


FIG. 50. Diagram showing the different layers of sutures before they are tightened, and their relation to each other. A is the point of first insertion where the knot is tied, and B, the point where the needle is next inserted upon the vaginal margin, coming out on the denuded area, and being again inserted at the point marked C. The short black lines running across the centre represent the exposed part of the first tier of sutures, and the short dotted lines running in the opposite direction represent that part of this same tier which passes under the tissue of the denuded area and is not exposed. At the lower part of the denuded area or base of the triangle where the first tier is completed the suture emerges at D, and is reinserted at E, for the beginning of the second tier. From this point to the apex the exposed loops of this second tier are represented by the longer black lines passing from left to right of the figure, and the buried portion of this same tier is represented by the dotted lines joining them. When the apex is reached the suture is brought out again upon the mucous membrane at the point marked F, and is reinserted at the point marked G on the vaginal surface.

The third tier is represented by the lines passing across the whole area from one side of the triangle to the other, the unbroken lines representing the exposed portion of the loops and the dotted lines that portion which is buried out of sight when the suture is tightened and the two sides are drawn together. The black dots upon the dotted lines marked H, show where extra insertions are made upon the denuded area to avoid leaving a space between the second tier of sutures and the vaginal wall, when the latter is closed over them.

The Purse-string Method of Closing the Perineal Wound.—When for any reason it is necessary to economize time, as, for instance, when several operations have been done previ-

ously at the same sitting, the purse-string suture may be employed for closing the perineum, the denudation having been accomplished in the manner described above. Only two sutures are thus required for complete closure of the perineum, and they can be introduced very quickly (see Fig. 51).

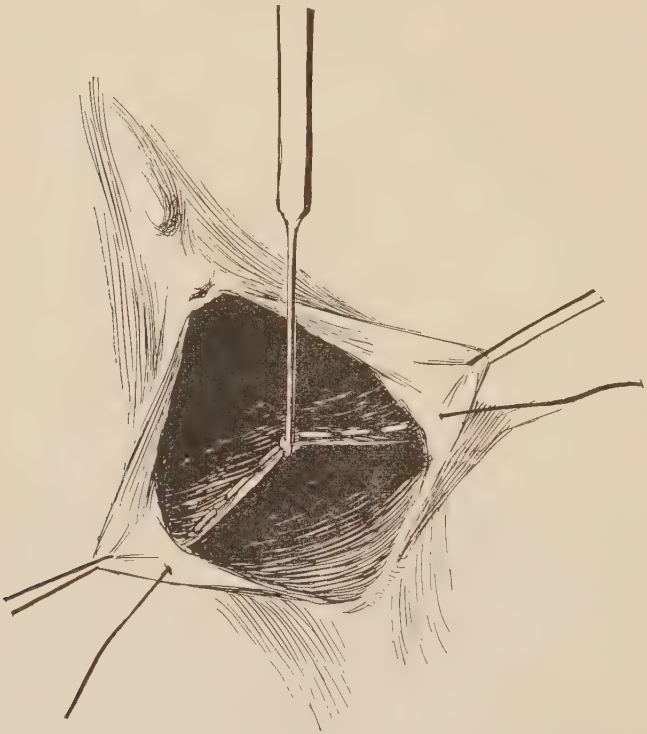


FIG. 51. Showing purse string suture in position, but not tightened.

In denuding the surface to be united by this method it must not be extended too far up the posterior vaginal wall, because the vaginal margin is drawn down to the vulva orifice by the purse suture. If, therefore, the posterior vaginal wall is encroached upon too much, it will be unduly shortened, and the uterus will be dragged down. In outlining the surface to be

denuded, the point where the tenaculum is inserted on the apex of the rectocele must be drawn down to the point of attachment of the traction ligatures on the vulva margins, and if there is too much strain upon the posterior vaginal wall the tenaculum must be removed and reinserted nearer the orifice. In other respects the denudation is done in the same manner as heretofore described.

For the main or purse-string suture silver wire (No. 25) is used, because it does not cut out or irritate and can be fastened more securely than other suture material, silkworm gut for instance. This is important, because this suture is required to sustain considerable strain. A carrying thread is used and a small, sharp-pointed, slightly curved needle, the same employed for the buried suture of catgut in the other operation.

The skin and mucous membrane are seized with the tissue forceps at the lateral limit of the denudation, on the margin of the vulva, just below the left traction ligature, and the needle is introduced upon the skin surface a quarter of an inch from the denuded margin at this point, penetrates deeply and is made to emerge upon the vaginal surface about the same distance from its cut edge just within the vulva (see Fig. 51). The carrying thread is now drawn through this tissue, so as to free the needle for its next insertion. Catching up the vaginal margin with the tissue forceps at regular intervals along the cut vaginal margin up to the apex, the needle is inserted successively through each tuft of the vaginal wall grasped by the forceps, and the carrying thread is drawn through each time. Thus the carrying thread is quilted along this margin from the vulva to the apex on the median line of the vagina above. From there, in the same manner, it is quilted along the right vaginal margin, penetrates the right vulva margin, and emerges on the skin at a point opposite the insertion on the left (see Fig. 52).

One end of the silver wire is bent over, and the angle is flattened down about a third of an inch from the end and is hooked into the loop of the carrying thread. The other free end is grasped with a pair of hemostatic forceps to avoid

dragging it all the way through. The carrying thread is now grasped near the needle with one hand, and the silver wire with the other, and drawing upon them so as to make both carrying thread and silver wire taut, with a quick jerk the silver wire is drawn through, taking the place of the carrying thread, which is then detached.

When tightened, this suture alone approximates the whole denuded area by puckering up the vaginal margin and draw-

FIG. 52. Showing purse string suture tied; second suture inserted, but not tied.

ing it up to the vulva orifice. Only one other suture is required, below this on the perineal surface, to approximate the skin. This suture is inserted about midway between the first suture and the lower extremity of the perineal wound. It is introduced from left to right on the perineal surface

about a quarter of an inch from the margin, passes entirely beneath the denuded area, is not exposed at any point in the wound, and emerges at a point opposite its insertion on the other side. The material used for this second suture is either silkworm gut or chromicized catgut. Before closing the wound it is irrigated freely with normal salt solution.

The purse-string suture is fastened in this manner, viz.: Seizing both ends, they are drawn upon so as to pucker up the vaginal margin through which it passes, then each strand is twisted around the other close to the vulva orifice as it emerges through the skin. The ends are then twisted together for a distance of two inches, a piece of small rubber tubing is slipped over them, the ends of the wire are bent down flat over the outside of the tubing, and a few turns of rubber adhesive plaster keep the tube from slipping down and protect the ends of the wire. The second suture is tied in the usual manner, always after the upper or purse-string suture.

Closure of Complete Laceration through the Sphincter Ani.—When the laceration extends through into the rectum and includes the sphincter muscle of the anus, this must be closed before the perineal laceration. It is better to denude both the rectal margins and the perineal surface completely before inserting any of the sutures, so as to avoid folding in any tissue which is undenuded. In denuding the rectal and anal margins a thick fold of tissue is seized with the tissue forceps at the anal margin on the left, and with either curved scissors or the trachelorrhaphy knife the cicatricial margin is removed rapidly up to the apex of the rectal tear. Then the right margin is removed in a similar manner. Where the ends of the anal sphincter are attached to the cicatricial tissue the exsection is extended more deeply, so as to expose the ends of the muscle for approximation.

For approximating the rectal mucous membrane interrupted sutures of No. 2 chromicized catgut are used. The first suture is inserted at the apex upon the rectal mucous membrane and is tied within the rectum, the ends being cut short and the knot dropped back into the rectum. The next

suture is introduced below that one, but near enough to secure close coaptation, the next one below this one, and so on until the anal margin is reached, each suture being tied as it is inserted and dropped back into the rectum. These sutures are made to include as little as possible of the muscular wall of the rectum or recto-vaginal septum, and in some instances they are made to include the mucous membrane only, the approximation of the muscular wall being secured by deep buried sutures introduced from above after the rectum has been closed. Before proceeding to close the perineum, a continuous suture of fine chromicized catgut, starting at a point somewhat above the closed tear in the rectal mucous membrane, is introduced so as to unite the muscular wall down to the line of the interrupted sutures in the rectum. As the anal orifice is approached the suture is made to penetrate more deeply and include the ends of the anal sphincter. This suture is brought out on the skin surface near the anal margin and tied. To strengthen this layer it is well to insert a second layer above it, bringing the suture out on the skin surface above the other and tying it in the same manner. In starting these sutures at the upper angle on the recto-vaginal septum a slip knot is employed instead of the ordinary knot, as the latter resists absorption longer. The first row of sutures for closing the perineal laceration is introduced immediately above this second row in the rectal wall, which is then completely buried beneath it.

The Dressing and After Management of the Wounds.—The dressing and subsequent management of both rectal and perineal wounds have an important bearing upon the result. The patient must be confined to bed in the recumbent position until complete and firm union has taken place, which is usually in two weeks, and the bladder must be emptied with the aid of a catheter for the first week, to prevent the urine from coming in contact with the wound. The surface must be kept free from moisture and perfectly dry for the first four or five days. It is not necessary to lock up the bowels unless the wound extends into the rectum, when they should be confined for the first four or five days, and the patient is kept upon a liquid diet.

When the operation is finished the perineal surface is cleansed and dried and the vagina is wiped out dry, then a drying antiseptic powder such as markasol is sprinkled freely over the vaginal wound and the whole perineum. Over this there is placed against the vulva and perineum a pad of several layers of plain absorbent gauze, and over this absorbent cotton which is held in place by a perineal binder. This dressing is renewed as often as is necessary to preserve an absolutely dry condition of the surface during the first week, and longer when required, until firm union is secured. The surface is not washed during this time unless the dressing becomes wet or soiled by discharge from the vagina or by accident during evacuation of the bowel. Washing is not otherwise necessary, because the powder employed is antiseptic and non-irritating, and as long as it is kept dry it is not necessary to remove it.

As a dressing to the rectal and anal wound and protection to the sutures, a hollow plug is inserted through the anal orifice, extending a short distance beyond the limit of the rectal wound. This is made of a piece of rubber tubing about three inches long, having a calibre the size of a lead pencil, wrapped around with several turns of iodoform or markasol gauze of the same width as the length of the tube. This is introduced immediately after the operation is completed, and serves as a soft elastic cushion for the rectum to contract upon, protects the wound from contact of the bowel contents or secretion, and permits the escape of gas which otherwise often accumulates and distends the rectum, causing discomfort and preventing or retarding union. This plug is retained for at least four days, while it is held firmly by the anal contraction. As a rule, it is not required longer, but a fresh one may be reinserted if it is necessary.

When catgut sutures are used they do not, of course, require removal. The silver wire suture used in the purse-string operation is not removed for twelve or fourteen days.

CHAPTER VIII.

ANTERIOR COLPORRHAPHY FOR PROLAPSE OF THE ANTERIOR VAGINAL WALL-CYSTOCELE.

Operation for cystocele has so often resulted in failure that it has been abandoned by some operators and is discouraged by others. Of the numerous operations for the cure of this condition the one here described is the only one that has been uniformly successful in my hands.

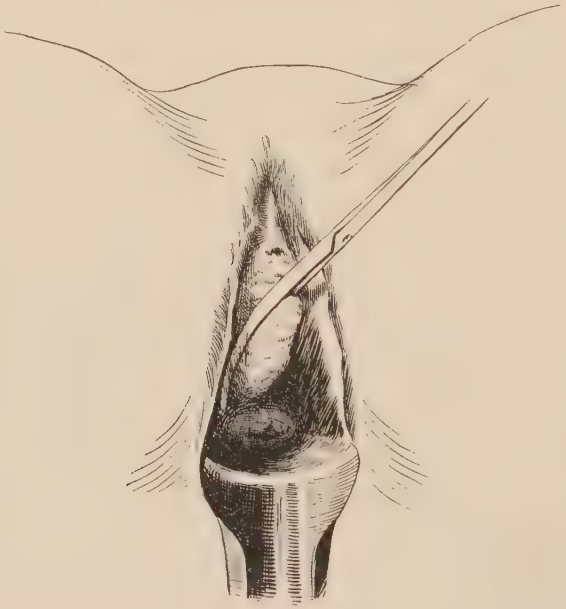


FIG. 53. Showing the redundant anterior vaginal wall grasped by curved, broad ligament clamp, so as to outline the extent of denudation necessary.

Preparation for the Operation.—The same careful preparation outlined for perineorrhaphy must be carried out for this operation, and the urine must be drawn with the catheter

either immediately before or after the patient is placed on the table. This is necessary because, owing to the prolapsed condition of the bladder, the patient cannot empty it completely herself. The external genitals must be shaved and scrubbed, and the vagina cleansed also as described for perineorrhaphy, the details of which need not be repeated here.

Technique of the Operation.—Denudation.—The first and most important step is to decide definitely the amount of slack to be taken up and the extent of denudation necessary to accomplish the object desired, without putting too much strain upon the sutures. The patient is placed in the same position as for perineorrhaphy, with the buttocks well down over the edge of the table, and a short, broad-bladed, hard rubber perineal retractor is inserted into the vagina, and given to the nurse to hold as she sits or stands to the left of the operator (see Fig. 39, chapter on Trachelorrhaphy).

The centre of the cystocele is now seized with tissue forceps, drawn down, and a curved broad ligament clamp is made to grasp the redundant vaginal wall logitudinally, as shown in Fig. 53. The clamp is pushed upward until it is evident that all the slack is included, but it is not clasped, as serious injury to the bladder or ureter might result. That portion of the vaginal wall below the blades of the clamp is to be removed, but it must be borne in mind that the base of the bladder is included and perhaps the ureters also, and care will be necessary to avoid wounding them. We may now mark this elliptical fold of the vagina included in the grasp of the forceps, either with a pointed aniline pencil or with a light stroke of the knife along the lower edge of the blade on each side from in front of the cervix to just posterior to the urethral orifice. The clamp is then removed, and the extent of denudation necessary is clearly defined. When a perineorrhaphy is to be done also and a narrowing of the posterior vaginal wall is necessary, we must be careful not to encroach upon the anterior vaginal wall too much laterally, as the vagina will be too narrow when both operations are completed.

To remove this portion of the vaginal wall which has been marked out will require much care to avoid penetrating the bladder or wounding a ureter, especially if the vesico-vaginal septum is very thin. In some cases there is entire absence of cellular tissue, which is usually found there, and the vaginal wall seems to be cemented to the base of the bladder. In these cases it will be safer to denude in strips with sharp curved scissors, beginning below and removing a strip

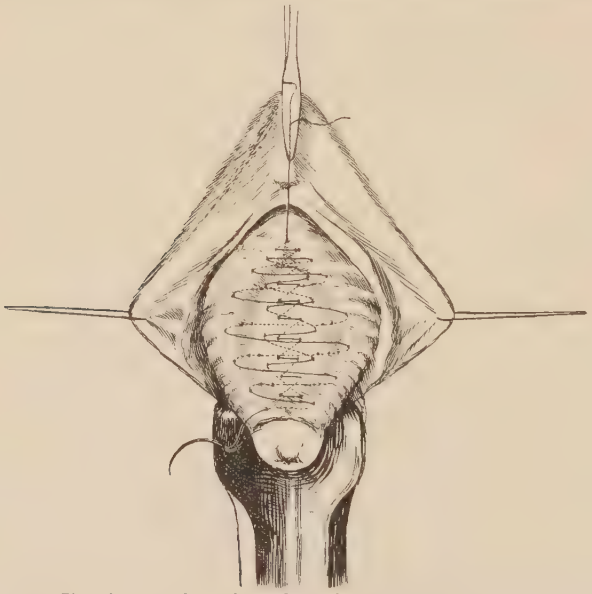


Fig. 54. Showing the insertion of the different tiers of suture for approximating the denuded area and vaginal margins. In the drawing the suture starts at the lower angle posterior to the urethra, whereas, as stated in the text, it is usually made to start at the upper angle in front of the cervix. For convenience, to better illustrate the different layers of suture, the artist has represented the cervix drawn down on to the speculum quite outside of the vulva orifice, which is not correct.

up the center to a point just in front of the cervix. Then a narrow strip is removed along each edge, and so on until the whole is removed. Denuding in this manner, the tissue forceps is made to seize a very thin strip of vaginal tissue, which is drawn out as much as possible to separate it from the bladder, and the scissors must be made to cut close to the

forceps so as not to encroach upon the wall of the bladder. Care must also be taken not to leave even the minutest part of the vaginal wall at any point. When the lateral limit has been reached the vaginal margin must be dissected up all around from the underlying tissue for a distance of at least a quarter of an inch, so as to permit the vaginal wall to slide over the base of the bladder when its edges are drawn together by suture. This, I have found, is a very important point often overlooked, which facilitates the approximation of the vaginal margins and lessens the strain on the sutures. It is a little detail, but has an important bearing on the result.

When the vesico-vaginal septum is not so thin and some cellular tissue remains, the vaginal wall may be made to slide upon the bladder and the denudation may be accomplished more easily and more rapidly. After removing the central longitudinal strip each lateral half remaining can be dissected up with a scalpel or with the cervix knife used in trachelorrhaphy. Then this flap on each side is removed with the scissors along the line marked out. In this method of denuding the dissection is carried a little beyond the line marked out before the flap is trimmed off, which leaves the vaginal wall free all around. It is very necessary to hug the vaginal wall when making this dissection, particularly over the base of the bladder and at the location of the ureters.

Introduction of the Suture.—To approximate the denuded area fine (No. 1) chromicized catgut is used with a small curved needle, as in perineorrhaphy. A long strand must be used so as to avoid leaving any knots buried beneath the surface. The suture is usually started at the upper angle near the cervix, but may start at the lower angle, as shown in Fig. 54. The needle is made to penetrate both margins of the vaginal wall near the angle, and the suture is drawn through to within three inches of the end and tied, the free end being clamped with pressure forceps (See Fig. 54). The needle is next made to penetrate a quarter of an inch from the vaginal margin on the left, about the same distance from the first insertion, and is brought out upon the denuded area

a little to the left of the median line. It is next inserted a little to the right of the median line upon the denuded area only, the suture being drawn through folds in the center of the denuded surface which it includes. Inserting the needle again to the left of the median line a quarter of an inch in front of the other insertion, and again on the right, more of the center is folded in. Continuing this suture along the center in this manner until the lower angle is reached, the whole of the center is folded in. (See Fig. 54). When this point is reached the suture is not brought out on the vagina, but is continued backward to the starting point, taking in the denuded surface to the outer side of the first row on each side, folding in the tissue and burying the first row out of sight.

These tiers of sutures are continued back and forth until the whole denuded area has been approximated, and there remain only the lateral vaginal margins to be united. The suture is now brought out on the vaginal surface at the upper angle, and the vaginal margins are united by an over and over suture, which terminates and is tied at the lower angle posterior to the urethral orifice. Thus the approximation of the denuded surface is accomplished with one continuous suture, and only two knots are tied—one at the upper and the other at the lower angle—and both are on the vaginal surface.

Dressing and After-Management.—The wound is dusted with some drying, antiseptic powder, such as markasol, and a flat tampon of several layers of gauze is placed in the vagina over it as a protection. This is removed after twenty-four or thirty-six hours and is usually not renewed, since to do so would disturb the line of union. Vaginal douches are to be avoided subsequently unless the character of the discharge from the uterus demands it, then a one per cent. solution of markasol or a weak solution of permanganate of potash is used as required.

The bladder should be emptied by catheter every three to four hours during the first week to prevent distention and strain on the sutures. After this, if it is evident that the

patient can empty the bladder completely, she may be permitted to void the urine every three to four hours.

The patient should be confined to bed in the recumbent position for at least three weeks, to avoid strain on the freshly united structures, and even after she is permitted to be up and about unusual care must be taken at first to avoid strain. To a neglect of this precaution may be attributed in great measure the failures following this operation, though the operations which fail are usually faulty.

This operation is frequently done in conjunction with trachelorrhaphy, and posterior colporrhaphy or perineorrhaphy. The latter, if successful, affords additional support for the bladder by bringing the posterior vaginal wall up against the anterior, thus restoring the normal relation of the parts.

CHAPTER IX.

VAGINAL CYSTOTOMY, TO CREATE AN ARTIFICIAL VESICO-VAGINAL FISTULA FOR DRAINAGE OF THE BLADDER IN CHRONIC CYSTITIS.

When a purulent cystitis in the female persists and does not yield to other measures the production of an artificial fistula in the base of the bladder, for the purpose of securing permanent drainage until a cure is established, is a recognized procedure.

Before submitting the patient to the great annoyance such a fistula necessarily entails a positive diagnosis of a chronic purulent cystitis should be made, and its absolute incurability by other means at our command should be demonstrated beyond a doubt.

To establish a diagnosis careful microscopic examinations of the urine and inspection of the interior of the bladder with the aid of the cystoscope must be made.

A catheter should also be inserted into one or both ureters, and specimens taken from each for microscopical examination, to determine if either or both ureters or kidneys are involved. This should be done prior to the operation, and can sometimes be accomplished without anæsthesia.

Technique of the Operation.—The labia and lower vulva should be shaved and scrubbed with green soap, and the vagina scrubbed with green soap and irrigated with a one per cent. solution of lysol. The bladder is then washed out with a solution of permanganate of potash, and thoroughly emptied.

The patient is placed on the left lateral semi-prone (Sim's) position, with a Kelly pad under the hip, which is drawn well down to the edge of the table. A perineal retractor is then inserted to expose the anterior vaginal wall—the field of operation.

A small curved Kelly broad ligament clamp is inserted closed through the uretha into the bladder. Directing the point of the closed clamp backwards to the base of the bladder a point is marked on the anterior vaginal wall in the median line, an inch and a half posterior to the meatus of the urethra. The handles of the clamp are now separated slightly, separating the points also, which are pressed firmly against the base of the bladder, opposite the point marked on the anterior vaginal wall, posterior to the meatus, as for the opening into the bladder. A small scalpel is now plunged through the vasico-vaginal septum at this point, penetrating between the separated blades of the clamp in the bladder, care being taken not to wound the anterior wall of the bladder.

The opening thus made is enlarged downward towards the urethra to the extent of a third or half an inch as the scalpel is withdrawn. The points of the clamp are pushed through the opening made and separated more widely, so as to expose the mucous membrane of the bladder.

To prevent union of the margins of the wound, the mucous membrane of the bladder and that of the vagina are united by two or more sutures on each side.

The bladder mucous membrane is seized with a tenaculum and drawn through the incision, and with a small, short, curved needle threaded with fine (No. 0) chromicized catgut the suture is passed through the bladder mucous membrane, then through the vaginal mucous membrane, excluding the intervening wall. This when tied draws these two mucous membranes together over the margin of the incision through the vesico-vaginal septum. Two or more of these sutures are inserted on each side, and when tied the operation is completed.

The patient is kept in bed for three or four days, and a vaginal douche of one per cent. solution of markasol is given to prevent irritation from contact with the urine. The vulva is kept dusted frequently with dry markasol to counteract the urine odor.

Applications to the bladder in the form of irrigations

through the urethra with view of a cure of the condition should be instituted at once. The solution conveyed through the urethra escapes through the opening into the vagina.

The solutions used may be markasol a half of one *per cent.*, permanganate of potash, or nitrate of silver. The first two may be used every day for the first week or two, then less frequently as the condition improves. The nitrate of silver solution should not be used so frequently. It is applied through an irrigator or directly to circumscribed areas through the cystoscope tube. If the opening contracts subsequently and becomes too small for effective drainage it should be enlarged. The fistula should be maintained until a positive cure is demonstrated, both by examination of the urine with the microscope and of the interior of the bladder with the cystoscope. Then it is closed, as any other vesico-vaginal fistula. (See chapter on technique of that operation.)

The period necessary for drainage and to establish a cure may be from three to twelve months.

CHAPTER X.

CLOSURE OF VESICO-VAGINAL FISTULA.

When this accident is discovered shortly after childbirth it is necessary to wait for involution of the vagina and healing of all raw surfaces before the injury can be satisfactorily repaired. While the vaginal wall is in a state of subinvolution sutures will not hold but will cut through the softened structure, and primary union cannot be obtained. It will, therefore, be necessary sometimes to delay operation for two or three months.

Involution of the vaginal wall can be hastened by daily applications of bipolar faradization with the current from the coarse wire coil, and afterwards the surface is dusted with dry markasol. Vaginal douches of a one per cent. solution of the same are given twice a day. Raw surfaces may be touched every two or three days with a solution of nitrate of silver until they heal.

If the general health is impaired, tonics and a generous diet, with life in the open air, should be prescribed as a part of the preparatory treatment. If nursing proves too much of a drain, preventing improvement in the general condition, the child should be weaned, but it must be borne in mind that involution progresses more satisfactorily, as a rule, during lactation, and this should not be arrested unless it is found to be absolutely essential. Under some conditions it would be better to keep the child on the breast, but feed it in conjunction with the nursing, which is permitted only twice a day so as to lessen the drain on the mother.

If the fistula is not discovered, or attention is not directed to it until after cicatricial tissue has formed, preparatory treatment with a view to softening this and removing encrustations from the urine should be instituted before the operation is attempted. Applications of tincture of iodine

and tampons soaked in glycerine should be made every second day, and a daily warm vaginal douche of a one per cent. solution of markasol should be given for two weeks.

Immediate Local Preparation.—Before placing the patient in position on the table the vagina is cleansed by scrubbing with green soap and irrigating the surface and vulva, which has previously been shaved, with a one per cent. solution of lysol. The bladder is then irrigated freely with a one per cent. solution of markasol. This is done with the patient on her back so that the solution may escape through the fistula into the vagina.

Position of the Patient on the Table.—Some operators prefer the dorsal position with the hips elevated and perineal and lateral retractors. The lateral or Sim's position is, however, most convenient, and is most frequently employed in this country, at least. A perineal retractor, in the form of a Sim's speculum, with broad blade, held by a well trained nurse with her right hand, who supports the upper buttock and draws the right labia upward out of the way with her left hand, affords ample view of the field of operation, and ample room for necessary manipulation. One advantage of the lateral posture, besides affording more convenient access for the surgeon, is that the urine gravitates from the field of operation.

Technique of the Operation.—The perineal retractor having been placed in position, the edges of the fistula are drawn together by a tenaculum caught in each margin at the center to decide in what direction the fistula may be closed with least tension on the sutures. This having been decided, the denudation is made accordingly, either transversely or longitudinally. The illustration (Fig. 55) shows the denudation being made longitudinally. It is made more satisfactorily with the special knife employed in denuding the lips of the cervix in trachelorrhaphy, and shown in Fig. 32, but some operators prefer scissors. When the tissue is soft, scissors are preferable, but when it is firm, the knife is more satisfactory.

The angle of the fistula is seized with a tenaculum or tis-

sue forceps, as shown in Fig. 55, and the knife is inserted on the vaginal surface well back from the margin so as to get into sound tissue, and the blade is so inclined as to emerge on the margin of the bladder mucous membrane. (Some operators do not include the bladder mucous membrane in the denudation for fear of troublesome hemorrhage. Should much bleeding follow from this source the submucous suture, represented in Fig. 58, will control it effectually.)

Fig. 55. Showing method of denuding edges of fistula with cervix knife.

By maintaining the knife at the same angle and drawing it firmly down along the edge of the fistula a solid wedge-shaped strip of vaginal wall is removed, leaving a clean-cut beveled denuded surface. The same thing is repeated on the opposite margin of the fistula; then, before detaching these strips at the angles, the denudation is extended beyond the limit of the fistula, but on the vaginal surface only, so as not to enlarge the opening into the bladder. This converts the irregular fistula into an elliptical opening, with shelving edges, scarcely larger than originally in the bladder wall, but considerably larger on the vaginal surface. (See Fig. 56.) This forms a broad denuded surface on each side for approximation.

If there is troublesome oozing during this step of the operation, the blood is kept washed away by a stream of hot sterile salt solution. When the denudation is completed the oozing is arrested by hot compresses, using a gauze sponge or pad in the grasp of a sponge forceps.

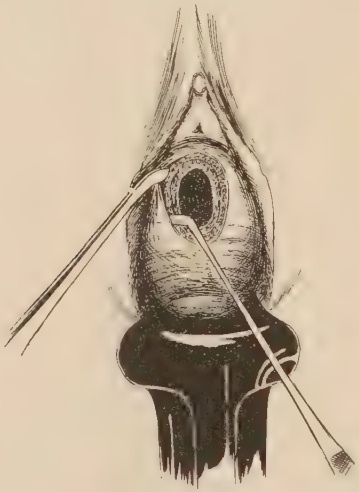


Fig. 56. Showing manner of freeing tension by separating vaginal wall from base of the bladder.

If the edges of the vaginal wound do not come together easily without undue tension, I have found that the tension is relieved by inserting the knife, as shown in Fig. 56, and separating the vagina from the base of the bladder all around to the distance of half an inch.

The bladder is now washed out with warm sterile water, to remove blood and clots before the sutures are inserted.

If the fistula is small, one row of interrupted sutures, as represented in Fig. 57, will be sufficient for accurate approximation of the denuded surfaces and the bladder mucous membrane, but if it is large these deep through-and-through sutures will not secure accurate coaptation of the margins of the bladder mucous membrane. In such cases I have found it more satisfactory to employ in conjunction

with the interrupted sutures a submucous, continuous suture of fine catgut inserted along the margin of the bladder mucous membrane, but upon the denuded surface (see Fig. 58) similar to the subcuticular suture of Marcy. This suture is introduced first by means of a fine, curved needle, and

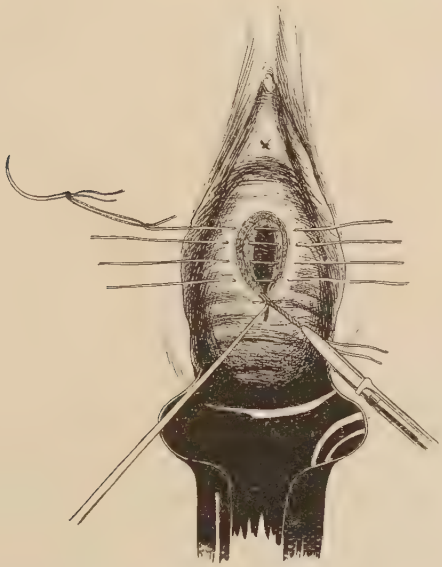


FIG. 57. Showing interrupted silver wire sutures inserted, and method of twisting them against the tenaculum.

when it is drawn tight the margins of the bladder mucous membrane are accurately approximated and rolled inward. This suture is not tied, but is held tight by traction on each end while the deep interrupted sutures are being inserted and tied. Then each end is fastened by taking a hitch loop through the solid vaginal wall a short distance beyond each angle of the wound.

The suture material used for the interrupted deep sutures may be either silver wire or silkworm gut, dyed black and rendered pliable by boiling in lysol solution, as described elsewhere. The advantages of silver wire have been enumer-

ated under the head of trachelorrhaphy. Some surgeons use silk and even catgut, but I cannot consider them a reliable or satisfactory suture material for this operation. Catgut may, however, be employed where extra sutures are required between the others to secure more perfect coaptation of the vaginal margins.

The silver wire sutures are always inserted by means of a carrying thread, as represented in Fig 57, but the silkworm gut may be threaded directly into the needle. For

Fig. 58. Illustrating the submucous suture. The upper part shows the suture tightened drawing together the margins of the bladder mucous membrane.

introducing these deep sutures a small, quarter-curved needle, with a sharp ground point that will penetrate readily, is employed.

The needle is held in the grasp of a long handled needle-holder, either at right angle to the shaft of the instrument or projecting straight from its end, according to the position of the patient, and the direction of the long diameter of the fistula. It is introduced upon the vaginal surface, well back from the margin of the denuded surface, penetrates the vaginal wall and underlying tissue down to the mucous membrane of the bladder, and emerges upon the denuded margin of the bladder wall without pentrating the mucous membrane. It is then drawn through and again inserted on the opposite margin, through the bladder wall first, then emerges on the vaginal surface at a point opposite its insertion on the other side. The margin of the fistula is steadied with a tenaculum as a counter pressure for the needle, so as to facili-

tate its insertion. As soon as the point of the needle emerges in the center upon the bladder wall the tenaculum is detached and passed beneath the point, which is drawn up so as to be grasped by the needle holder and pulled through. The same manœuver is repeated when the needle point emerges upon the vaginal surface on the opposite side.

When silver wire is used the needle with carrying thread is drawn through one margin before being passed through on the other side, and both are then drawn through the opposite side also before the suture is pulled through, though the silver wire is hooked into the loop of the carrying thread when the needle is inserted so as to avoid pulling the loop of the carrying thread all the way through, as might otherwise occur when the needle is forcibly pulled through resisting tissue. To draw the silver wire through into position the free end is grasped between the thumb nail and fore-finger of the right hand, bending it slightly by pressure with the nail, to prevent slipping, and the carrying thread near the middle is grasped with the left hand, and the whole carrying thread and suture are made tense. With a sea-saw motion from side to side the suture is drawn through suddenly with a quick motion from right to left, holding the suture and carrying thread loop tightly all the while. The loop of the carrying thread is then detached from the suture, and each side is then clamped with a pair of pressure forceps, which are permitted to hang down conveniently out of the way.

The first suture is usually introduced in the center of the wound, taking care to approximate the margins of the fistula in the center first with a tenaculum inserted in each edge before introducing the needle, so as to determine the proper position for the suture. Afterwards the other sutures are introduced on each side of this first one, about a quarter of an inch apart. Enough sutures are inserted to close the wound perfectly. At the angles care must be taken to secure accurate coaptation of the edges. When these sutures are tied or fastened, if there is any gaping of the margins between the sutures, intermediate sutures of fine chromicized catgut are introduced.

When all the sutures have been introduced the central suture is tied first, then the others on each side of it, and last those at each angle.

The silkworm gut sutures, if employed, are tied and their ends either cut short about an inch from the knot, or they are bunched together and drawn downwards toward the vulva and secured with a silk ligature, tied securely around, then wrapped with a strip of adhesive plaster wide enough to extend beyond the ends of the sutures, which are cut off even. There should be no undue tension on the sutures when tied, but only just sufficient to bring the edges of the wound accurately together.

Silver wire sutures are fastened by twisting the two ends together. The ends of the suture are grasped with a wire twister, held in the right hand, and with a tenaculum in the left the wire is shouldered (see article on trachelorrhaphy) on each side at the margin of the wound, while the loop is drawn tight by traction on the wire twister. The tenaculum is then made to catch both strands of the wire where they are shouldered close to the margin of the wound, and the ends are drawn across at right angles to the tenaculum and twisted by rolling the wire twister between the fingers (See Fig. 57). In this manner the ends are twisted only up to the point of contact with the tenaculum, which holds the edges of the wound accurately together and prevents the suture from being twisted too far down and constricting the tissues by having the loop too tight. The twisted end of the suture is bent down flat upon the vaginal surface and cut off an inch from the margin of the wound.

When all the sutures have been twisted, if one appears too tight and the tissues are too much constricted the loop should be loosened slightly, not by untwisting the ends, but by introducing a tenaculum point under the loop on each side of the wound, and gently drawing upon the loop away from the center or line of the wound.

The vaginal surface and wound are now irrigated freely with plain sterile warm water and dried with a gauze pad. The wound and surrounding surface are then dusted with

dry markasol, and a loose dressing of plain, sterile gauze is inserted into the vagina to protect the wound.

When the fistula is situated well forward near the neck of the bladder care must be taken to avoid including one or both urethral orifices in the denudation or in the loop of a suture. To obviate hemorrhage into the bladder from the margins of the incision, the submucous suture shown in Fig. 58 is employed.

After-Treatment.—In some cases it will be necessary to insert a self-retaining catheter into the bladder to keep it drained for the first few days, and after this the urine should be drawn every three or four hours. In other cases it will suffice to draw the urine every three or four hours for the first two or three days, then permit the patient to void it herself every three to four hours. If the fistula was a small one the catheter may be dispensed with altogether.

If there is much pain during the first twenty-four hours it is quieted by morphia given hypodermatically.

The vaginal tampon is removed after forty-eight hours, or before, if it becomes soiled with urine. The wound is then dusted with markasol, but the tampon is not replaced.

The bowels may be moved on the second or third day and every day thereafter.

The sutures are removed any time after the thirteenth or fourteenth day.

The patient is made to retain the recumbent position until after the sutures have been removed and the suture tracks have healed. From the first the patient is permitted to turn from side to side, or on the back, but is never permitted to sit up or rise up in bed.

CHAPTER XI.

AMPUTATION OF THE CERVIX UTERI.

Amputation of the cervix may be either *partial* or *complete,* depending upon the condition demanding it. Removal of the vaginal portion (partial amputation) is done for elongated cervix, disease of the Nabothian glands, associated with laceration, and for prolapsus.

Complete amputation includes removal of the entire cervix up to the level of the internal os or beyond, and is done for carcinoma which is confined to the cervix.

Technique of Partial Amputation.—No especial preparation is necessary for this operation beyond that required for anæsthesia and for securing a perfectly aseptic condition of the vulva and vagina, which has already been described.

The patient is placed on the table either in the lateral (Sims') position, or on the back in the exaggerated lithotomy position, according to the convenience and preference of the operator. If the dorsal position is chosen the buttocks should be drawn well down over the edge of the table, so that the handle of the speculum or perineal retractor will not impinge against it. This is held by the nurse in her right hand, as she sits to the left of the operator.

A rubber pad of ample size is placed under the patient, with the flap falling into a bucket or other receptacle on the floor, at the foot of the table.

The perineal retractor should have a short, broad blade, so as to expand the vulva orifice, and permit the uterus to be drawn well down. It is inserted behind the cervix, which is then seized with angular tenaculum forceps, and drawn out at the vulva. A traction ligature of stout silk or linen thread is now passed through each lip of the cervix in the median line, well back from the margin so it will not tear out. With these the uterus is dragged down and the lips of the

cervix are drawn apart, exposing the canal and angles. The cervix is then split laterally with a pair of stout, straight scissors from the angle to the cervico-vaginal junction on each side. One blade of the scissors is inserted into the canal while the other is passed up on the outside. (See Fig. 59.)

If the bleeding following these incisions is not excessive it may be disregarded, since it will be arrested when the sutures are inserted. But if the circular artery of the cervix has been severed the hemorrhage will be troublesome, interfering

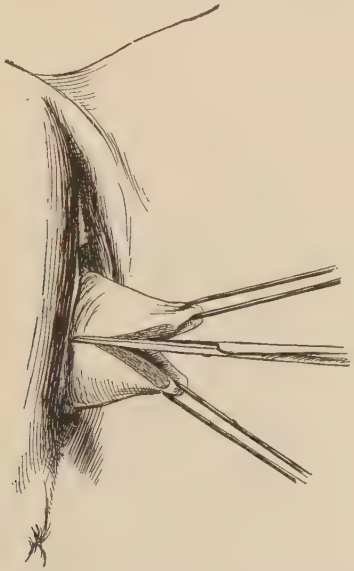


FIG. 59. Showing the application of traction ligatures in anterior and posterior lips of the cervix, and method of splitting the cervix at the angles.

with the subsequent steps of the operation, and a suture should be immediately passed beneath the vessel and tightened. This may be either a temporary ligature, or may be so inserted as to constitute the first suture at the upper angle of the incision. It is introduced by means of a long, stout, curved needle, such as is employed in trachelorrhaphy, with carrying thread attached.

The needle held in the firm grasp of a long handle needle forceps is inserted deeply into the tissue of the cervix at the upper angle, being made to penetrate quite through the wall down to the canal, and emerge on the opposite side of the incision. (See Fig. 61.) This suture is tightened temporarily by grasping it close to the cervix with a pair of pressure clamps, or if it is a permanent suture of silver wire it may be twisted tight enough to control the hemorrhage. If it is a temporary ligature of silk it may be tied now, and removed later when the permanent sutures have been intro-

FIG 60. Showing cervix split through both angles, and method of amputating the lips with the knife.

duced. An expert operator will make this a permanent suture always, as in the end it saves much time, but one with little experience in introducing these sutures in the cervix will be able to control the bleeding more quickly by inserting a temporary ligature which is carried only deep enough

to pass under the artery, with no effort to secure accurate coaptation of the two sides.

The next step is to amputate both anterior and posterior lips of the split cervix. This may be done either with scissors or the knife; preferably with the latter, because it is more accurate and the margin of the resulting stump is consequently even and regular. As represented in Fig. 60, the incision is commenced at the extremity of the angle on one side, and curves downwards to the center, and up again to the opposite angle. The knife is held so as to have the blade enter the canal higher up than where it severs the outer portion of the cervical wall, thus making the piece removed wedge-shaped, and leaving the stump beveled from without inward. This, when both lips have been amputated, permits the two flaps of the stump to be brought together more evenly.

The sutures uniting these flaps are inserted in the same manner as in trachelorrhaphy, but since there is no canal left, nor strip of mucous membrane to form a new canal as in that operation, it is necessary to be careful not to have the sutures on each side encroach so much upon each other as to close the stump completely when the sutures are tightened. Silver wire is to be preferred to any other suture material, and the sutures are introduced by means of a stout quarter-curved needle with carrying thread, as described for doing trachelorrhaphy. The upper suture is inserted as represented in Fig. 61, emerging in the canal of the stump, thus securing accurate coaptation at the angle, and leaving no space for blood to collect and interfere with union. Three sutures on each side will usually be sufficient. The two lower sutures should be at least a third of an inch apart, and should not penetrate very deeply.

Before the sutures are tightened permanently, the flaps are spread apart, and their inner surface is irrigated freely with hot normal salt solution to wash away the small clots and check the oozing.

After the sutures have all been twisted (silver wire being preferred for suture material) and bent down upon the

surface of the stump, as described under the head of trachelorrhaphy, a small clinical double current irrigator is introduced between the two rows of sutures through the internal os into the cavity above, and it is washed out with a warm one per cent. solution of lysol. This insures an ample opening through the stump up into the uterus. A strip of iodoform gauze sufficiently thick to fill it is now passed up

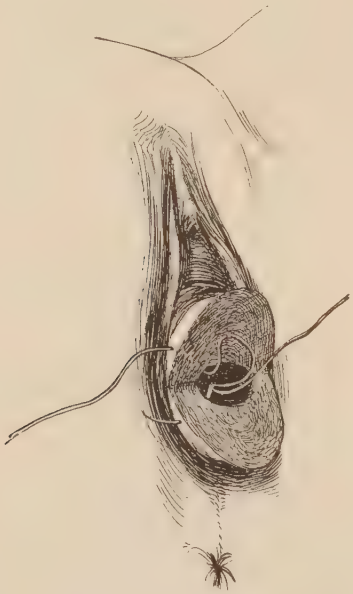


Fig. 61. Showing the method of inserting the suture at the angle after amputation of both lips is completed.

through this canal into the uterus to provide drainage and prevent it from closing. A small glass drainage tube with flange for the stump to rest in, passed up through this canal into the cavity above, is a better means of preventing closure of the newly made canal, affords better drainage, and requires less subsequent attention than the strip of gauze. It is kept in place by a loose tampon of iodoform gauze against it in the vagina.

The subsequent management of these cases is simple. When the glass drain is employed it is only necessary to give a warm vaginal douche every day after the first three days, when the drain is removed, cleared of obstruction, and replaced. When the gauze drain is employed, this is removed and a fresh one inserted every day after the first forty-eight hours, during which time it is left undisturbed. The drain is kept in the canal for a week or ten days at least, and after it is discontinued a conical dilator or the clinical irrigator should be passed every few days to prevent contraction and closure of the newly formed canal.

This should be maintained until the sides of the canal have healed over. If contraction occurs or threatens subseuently it may be overcome by using, every three or four days, a conical electrode with moderate negative electrolysis.

Technique of Complete Amputation.—The patient is placed in the same position as for partial amputation—either on the back or the side. After shaving the pudenda and thoroughly cleansing the vulva and vagina the bladder is emptied by catheter, then the short, broad perineal retractor is introduced, and the cervix is exposed by lifting up the anterior vaginal wall with the thumb or sponge forceps. The cervix is seized on each side, well back of the diseased portion, by angular tenaculum forceps, and drawn down to or near the vulva orifice. With a scalpel the mucous membrane covering the cervix is incised all around well up towards the cervico-vaginal junction, beyond the diseased portion, and above the attachment of the tenaculum forceps on each side.

When the disease involves most of the cervix this incision is made at or just above the cervico-vaginal fold. This circular incision penetrates the vaginal wall completely, down to the cervical tissue. Increased traction is now made upon the cervix, and the two tenaculum forceps are grasped in the left hand, while with the thumb or fore and middle fingers of the right hand, and with blunt-curved scissors closed, the vaginal vault is dissected back all around. (See Fig. 62.) The side of the uterus is hugged closely throughout this dis-

section to avoid wounding the bladder in front or entering the peritoneal cavity behind, and laterally to prevent injury of the uterine vessels. If care is observed these vessels may be peeled up from the side of the uterus and the hemorrhage following the dissection is insignificant. It is better

Fig. 62. Showing tenaculum forceps in position and method of peeling vaginal vault from the cervix.

always to avoid severing or ligating these vessels if possible, though when it is unavoidable a stout catgut ligature is carried around them close to the uterus by means of the special aneurism needle described for ligating the uterine artery. This ligature is tied, and the dissection is proceeded with as before described.

The dissection is not always carried up far enough to encounter these vessels which join the uterus on a level with the internal os. The cervix is usually amputated a little below that point.

When the desired limit has been reached the cervix is amputated by a transverse incision with a scalpel from it in front backwards, as represented in Fig. 63. Freely bleeding points in the field should be caught and ligated with medium size catgut, unless so situated that the hemorrhage will be controlled by the sutures inserted for closing the wound.

FIG. 63. Showing method of amputating with scalpel.

The remaining stump is to be covered by the redundancy of the vaginal mucous membrane that has been peeled up from the cervix. This is done by uniting it with interrupted sutures all around to the mucous membrane lining the canal of the stump, as represented in Fig. 64. The suture material used may be catgut, silkworm gut, or silver wire. They are inserted by means of a stout quarter-curved needle like that employed in trachelorrhaphy. A tenaculum is fastened in the margin of the canal of the stump and the sutures

are introduced from within out. That is, the needle is first inserted in the mucous membrane of the canal, a short distance from the margin, and is made to penetrate the substance of the uterine tissue constituting the stump, and is brought out on the vaginal surface a short distance from the margin. The course of the needle through the substance of the stump is made more superficial than where it is inserted and brought out, but the whole is buried beneath the surface.

This method of inserting the sutures approximates the two margins very effectually when the sutures are tied, and

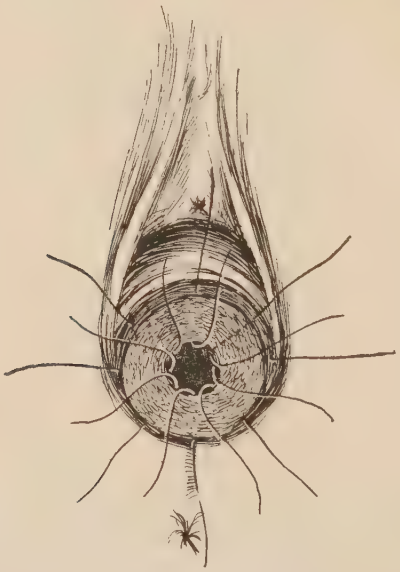


FIG. 64. Showing sutures inserted for covering the stump of the cervix.

obviates the leaving of dead spaces where blood and serum may collect and prevent union, as is the case when the suture is exposed in the centre of its course across the stump. From seven to eight of these interrupted sutures are usually sufficient.

Before tying the sutures the stump is irrigated with salt

solution, and the cavity of the uterus is thoroughly washed out with a double current irrigator. The cavity is most always carefully curetted before the amputation is begun, but it may be done afterwards.

If catgut sutures are used the ends are cut off half an inch from the knot. Silkworm gut sutures may be treated in a similar manner, but to avoid irritation from motion of the sutures when the ends are cut short and stick into the wall of the vagina the ends are left long, and all are gathered together and brought down and tied together, and a piece of rubber tubing is slipped over the bunched ends and fastened so as to conceal the ends of the sutures within the tubing. The ends should never be left long enough to reach the vulva, however. When silver wire sutures are employed the twisted end of the suture is cut off an inch from the surface, and the remaining end is laid down flat on the vaginal vault by grasping the extreme end with a pair of dressing forceps, and bending it at right angles to a tenaculum placed against the suture at the surface of the united vaginal wall and cervical stump. (See illustration under Technique of Trachelorrhaphy.)

The vagina is then wiped dry and a loose dressing of iodoform gauze is inserted. This is removed after forty-eight hours, and renewed, or not, as required.

Vaginal douches are employed subsequently only if required to cleanse the vagina of discharge.

The sutures, if silkworm gut or silver wire is employed, are removed in about twelve or fourteen days, and if union is complete then the patient is permitted to get up. During the period of confinement in bed she should retain the recumbent position.

CHAPTER XII.

MAKING AND CLOSING CŒLIOTOMY WOUND.

Only the reckless surgeon will attempt to open the abdomen with one stroke of the knife. This is done, not in the interest of the patient, but for effect upon the spectators, on the supposition that it displays skill. On the contrary, it is reckless daring which is wholly unjustifiable and certainly not commendable. The best surgeons are usually most careful in making the abdominal incision, and particularly as the peritoneal cavity is approached. The experienced surgeon knows there is occasionally danger of wounding a loop of intestine which may be situated across the line of incision in front of a tumor, and does not care to submit his patient unnecessarily to this risk. In fact, the more experience he has the more careful he becomes. The conscientious surgeon will always consider the interest of his patient before the effect he may produce upon the bystanders. Experience teaches him when to exercise care, and when he may economize time to the best advantage of his patient and the result which may be obtained.

In making the abdominal incision, while it is well not to spend time upon it unnecessarily, it should be done with care and precision, and never hastily or carelessly. The length of the incision is a matter of some importance. It should never be made longer than is actually necessary, and should not extend beyond the umbilicus when it can be avoided, yet there should be no hesitancy in making it sufficient for all practical purposes for the work to be done. The incision is frequently made insufficient at first and extended to meet the requirements of the case after the peritoneal cavity has been opened. This is done expressly to avoid an unnecessarily long incision. The length of the incision will therefore depend upon what is to be done, and

must vary with the case and the individual experience and skill of the operator. It is impossible to lay down any hard and fast rule upon this point. In a general way it may be stated that operations for suspending the uterus from the anterior abdominal wall or for removing the appendages should not require more than a two and a half or a three inch incision, while removal of the uterus will necessitate an incision extending quite up to the umbilicus sometimes, even if the tumor to be removed is not very large, particularly if the abdominal walls are thick. For removing an ovarian tumor, even of large size, the incision need not and should not extend beyond the umbilicus, because the fluid is withdrawn first and the collapsed sack is drawn out afterwards, and this may be done through a comparatively small incision. Solid tumors will require an opening in proportion to their size, and it is by no means uncommon in large tumors of this kind to extend the incision nearly to the ensiform cartilage.

The preparation of the surface of the abdomen is important in that it must be rendered absolutely, surgically clean. The patient is given a bath the evening before the operation, when the condition does not contraindicate, and the abdomen is covered with a soap plaster or poultice for the purpose of softening the cuticle and making the surface more easily cleansed. This is prepared by spreading green soap upon several thicknesses of gauze folded into a pad of the required size, and it is held in place either by a roller bandage or a broad binder which encircles the body. On removing this the next morning the surface is washed with warm water and shaved carefully, every hair in sight being removed. The pubes and vulva are also carefully shaved and cleansed with the green soap and water, using a nail brush. The surface is dried after the soap has been thoroughly rinsed off, and it is covered with a pad of gauze wrung out of a one per cent. solution of markasol* which is held in place by a bandage and is not removed until the patient is placed upon the operating table. The surface is then uncovered and is again scrubbed with nail brush and

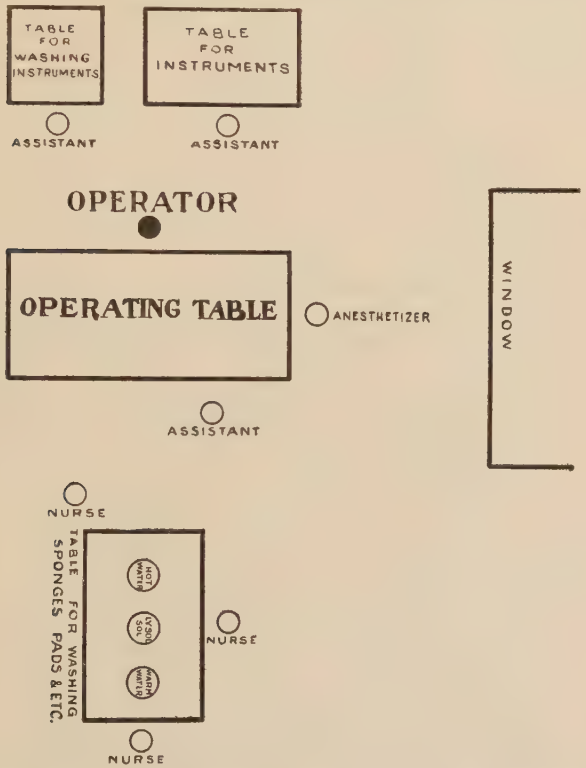
green soap. Afterwards it is washed with ether and a pledget of clean absorbent cotton, and then with plain sterilized water. Sometimes alcohol is used also after the ether, but it is really uncalled for.

Towels used about the operation are either dry sterilized or they are wrung out of a one per cent. solution of lysol instead of bichloride solution, which is so often used because it does not injure the instruments, and it is quite as efficient. These towels are folded around the clothing pulled up above the abdomen and the edge of the blanket below covering the legs, and one is placed lengthwise on either side and pinned at each end to that above and below, thus forming a square opening in which the abdomen only is exposed to view. Other towels are placed so as to cover completely the clothing of the patient about the chest and shoulders, and the blanket which protects the legs. It is best to place over this finally a sterilized sheet (sufficiently large to cover up everything) which has a square opening in the center to expose just enough of the abdomen as is required for the field of operation.

Three assistants besides the anæsthetizer and three trained nurses are required. The first assistant stands to the left of the table to render the operator immediate assistance, and he should have assisted sufficiently often to be able to do the operation nearly as well as the operator himself, but he should not be one who thinks he can do it better, and above all he must have complete control of his tongue, and know enough not to make suggestions when they are not asked. A good first assistant is one of the urgent essentials about an operation next to a good operator. The table holding the instrument trays is more conveniently placed to the left of the operating table and to the operator's left, and the second assistant stands between this table and the operating table, that he may turn readily from one to the other as he passes the instruments.

The second assistant has charge of the instruments, which he passes to the operator and the first assistant, as they are required, and he should have sufficient familiarity

with the operation on hand to be able to anticipate what is required and have it in readiness that the operator may not be compelled to call for it. He should have everything prepared before the operation begins, threading the needles which may be required, and having in hand, ready in solu-



tion, all instruments which may possibly be called for. Those which he is certain will be used he will have placed most conveniently, arranged in such order that he can put his hand on any instrument required without being obliged to hunt for it, which would retard the operation. Those instruments not likely to be used are placed by themselves, but in order ready for use. The pressure forceps should be

placed conveniently in a vessel by themselves, the short ones in one vessel, and the long, broad ligament clamps in another. The number of both in use should be recorded, and they should be counted and all accounted for before the abdomen is closed. His attention must be directed exclusively to his instruments and the operation, and nothing else should claim his attention.

The third assistant takes the instruments which have been used, removes the blood by washing with a gauze pad in a one per cent. solution of lysol, and replaces them in the solution in the exact position from which they were taken, that they may be ready when again required. He also keeps the needles threaded that are returned after being used, and stands ready to render any extra assistance which an emergency may demand.

The first nurse has charge of the operating room, sees to its preparation, the making of the solutions, and the arrangement of the towels about the patient. She must keep track of all sponges and pads used, counting them before and after the operation, and notify the operator promptly, before the abdomen is closed, if any are missing. She should never attempt to remember the number in use, but must have a pad or slate at hand and mark it down beforehand. During the operation she stands to the left of the first assistant, ready to pass fresh sponges and to receive those used, which she passes to the second nurse for cleansing.

The second nurse during the operation attends exclusively to washing the sponges and pads which have been used. She stands to the right of the first nurse, facing her, with a table in front of her on which are placed three basins, one containing hot water, in which she places the clean sponges and pads, one in which there is a one per cent. solution of lysol for cleansing them, and one of plain sterilized water for rinsing them afterwards.

The duty of the third nurse is to change and replenish the basins used by the second nurse as required, and keep in readiness an abundant supply of hot towels. Another nurse

will sometimes be needed for replenishing the solutions which have been used, and preparing normal salt solution as required, as none of the others can well be spared from the duties which have been allotted to them.

All of the assistants, including the nurses, should have their hands, forearms and elbows thoroughly sterilized, as well as the operator. They should also wear caps which cover the head and confine the hair, and sterile gowns which cover the clothing, or a special suit.

Making the Abdominal Incision.

The operator should have full confidence in his ability to execute successfully the operation in hand, else he should never attempt it. He must likewise be fully prepared to cope with any emergency which may arise, and there are many, often wholly unexpected. He stands on the right, facing the head of the operating table. With his left hand he first grasps the abdominal wall to ascertain its thickness, then spans the median line with the fingers and thumb of the same hand about on a level with the umbilicus, to render the skin tense, pulling it up at the same time to make it resist the downward stroke of the knife. He calculates accurately from the thickness and resistance of the abdominal wall the degree of force necessary to make his first incision sever the skin and underlying fat down to the linea alba. The incision must be straight and directly in the center, and may extend from the point selected above to within an inch of the pubes.

At this point, before proceeding, any spurting vessels should be clamped with pressure forceps, which are turned over to one side and left lying flat on the surface of the abdomen. Oozing may, however, be disregarded. Also any bleeding which occurs upon dividing the muscular layer should be controlled in like manner before the peritoneal cavity is opened. If the clamps are in the way at any time, the vessels may be either twisted or tied with small size catgut, and they are removed. The linea alba, which constitutes the fascia referred to further on, and the muscle

beneath are severed with a few rapid, light strokes of the knife, and there is exposed immediately below the subperitoneal fat. The amount of this fat varies with the thickness of the abdominal wall and condition of the patient. Sometimes it is considerable and much careful dissection is necessary before the peritoneum is reached. Then again it is nearly or completely absent, and the peritoneum is immediately beneath the muscular layer with nothing intervening. This is apt to be the case when the abdominal wall has been stretched out and thinned by the pressure of an abdominal tumor. Therefore much care is necessary, after penetrating the muscular layer, that the peritoneal cavity be not opened inadvertently before it is expected, and the intestine wounded. To obviate this the operator takes in his left hand a pair of thumb forceps, and the first assistant takes a similar forceps, and the tissue on either side of the median line at the bottom of the incision in its center is seized and lifted up, and that between the points of the two pairs of forceps is severed carefully with the knife. This lifting up of the tissue holds the layer of abdominal peritoneum away from any underlying organ or structure, and makes the penetration of the peritoneal cavity safe, provided there are no firm organized adhesions at this point.

The cavity once entered the opening in the peritoneum is enlarged sufficiently to permit the introduction of the index finger of the left hand, which is directed first downward towards the pubes, with the palmar surface up, and using this as a guide, lifting the peritoneum up, it is severed with the scalpel or a pair of scissors. Then turning the finger towards the upper angle of the incision, that portion of peritoneum is severed in like manner.

If the original incision is found to be insufficient, it is enlarged by passing the middle and index fingers of the left hand, with palmar surfaces up, into the cavity at the upper angle of the incision, lifting the whole abdominal wall up, which is then severed with a pair of stout scissors passed along between the fingers as a guide. If it is necessary to extend the incision beyond the umbilicus, the line of incision

is deflected around it through the muscular layer to one side and extended in the median line again above. This is done to assure a firm, unbroken line of union when the incision heals.

When it can be anticipated that the operation will necessitate much handling of the wound the peritoneum is attached to the skin surface on either side by two or three temporary sutures of silk, the ends of which when tied are left long that they may be utilized for retracting the abdominal wall. This obviates handling or bruising of the muscular layer which sometimes interferes with primary union. These sutures are removed, of course, before inserting the sutures for closing the wound.

Closing the Abdominal Incision.

The closing of the incision is one of the most important steps in all abdominal operations; the best evidence of which is the variety of methods that have been suggested. A detailed description of all these different methods would be useless and unprofitable, not because the methods are necessarily at fault, but because the writer believes the one he has finally adopted is the simplest and most satisfactory, in that it gives a firm and unyielding line of union, and he has never known it to give way.

There are two kinds of sutures employed, viz.: interrupted deep sutures of silkworm gut which include the whole thickness of the abdominal wall with the peritoneum, and a continuous suture of fine chromicized catgut for uniting the peritoneum, muscular layer, and fascia. The silkworm gut is put through a process which renders the surface absolutely aseptic, and it becomes nearly as pliable as catgut. Thus it can be tied more readily and the knots are more reliable. Each strand is wiped off thoroughly with a pledget of cotton or gauze saturated with ether, and the frayed ends are cut off. They are then placed lengthwise in a glass tube of sufficient length to accommodate them. One end of this tube is stopped with a cork and it is filled with a two per cent. solution of lysol, and placed in a boiler with

the open end considerably above the level of the water. The boiler is then covered and the water is boiled for half an hour. Before it is taken from the boiler a previously sterilized cork is inserted into the tube. This tube containing the sutures is placed upon the instrument table during the operation, with one end supported higher than the other, so that the solution will not run out, and, as needed, the strands are drawn out with a pair of thumb forceps.

The catgut, which I now invariably use, is put up in sealed glass tubes partially filled with alcohol which are opened by breaking at the time of the operation. Thus there is no chance for the gut to become infected after it is once prepared. This gut is sterilized by the manufacturer* by boiling under pressure, and should the operator care to repeat this process as a matter of satisfaction to himself he may throw these tubes into a boiler for a time before the operation, as the alcohol boils at a much lower temperature than water. The convenience and reliability of this gut will be readily appreciated. The chromicized catgut prepared and put up in this way has been found to last for three or four weeks, even the size (No. 1) employed in the abdominal wound.

The needles used for inserting the silkworm gut sutures are large, quarter-curved, two and a half inches long. The suture is passed through the eye of the needle, and the short end twisted around the other to prevent it from slipping out. At least half a dozen of these needles will be required, and the assistant should have all of them threaded and in readiness at this stage of the operation, and when more are used they are threaded as needed. They are passed with the aid of a needle forceps. It is usual to insert a gauze pad spread out flat over the intestines, to protect them from injury by the needle, which is removed just before bringing together the peritoneal margins at the lower angle of the wound.

Beginning at the upper angle of the wound, the first interrupted silkworm gut suture is inserted on a level with

*Geo. St. John Leavens.

the limit of the incision on the peritoneal surface. Two fingers of the left hand are inserted between the gauze pad and the abdominal wall, which is grasped by them and the thumb on the skin surface and lifted up. The needle carrying the suture is entered about half an inch from the margin of the incision on the skin surface on the left side, and penetrating the thickness of the abdominal wall obliquely comes out on the peritoneal surface within a quarter of an inch of the edge. The muscle and fascia are apt to retract under the skin surface, and to be certain that they are included in this suture sufficiently far back the first assistant grasps the fascia with the thumb forceps and draws it out on either side as each suture is inserted. Having penetrated the wall on one side the needle is passed through that on the other side at this point without withdrawing it, from within outward, taking the different layers in the reverse order, viz.: penetrating the peritoneum a quarter of an inch from its margin, then the muscle and fascia, and coming out on the skin on the opposite side of the incision, half an inch from its edge. In passing the succeeding sutures, except the last one at the lower angle of the wound, it will be necessary to draw the needle through after the wall on one side has been penetrated, and reinsert it on the peritoneal surface of the opposite side.

These sutures are placed about three-quarters of an inch apart, and as each is drawn through, the needle is detached and each end is clasped with a pair of pressure forceps. This is done, instead of clasping both ends together with one forceps, so the field will be left free for inserting the other suture which unites the muscle and fascia. The lowermost suture, like the upper, is inserted on a level with the limit of the incision in the peritoneum.

At this point, before closing the peritoneal cavity, all the sponges or pads and pressure forceps must be counted, and any which are missing must be accounted for, that none may be left in the peritoneal cavity.

For uniting the peritoneum and fascia a small, short needle, slightly curved near the point, is threaded with a

long piece of the fine chromicized catgut (No. 1) long enough to include the peritoneum and fascia in two layers of suture without interruption. Beginning at the upper angle the peritoneum is drawn out, and the needle is inserted very near the limit of the incision, the suture drawn through and tied with a slip knot. The next insertion of the needle is made to include a part of the muscular layer as well as the peritoneum,* but the fascia is excluded, and continuing in this way to the lower angle of the wound the peritoneum and muscular layer are united with a continuous suture. The peritoneal cavity being now closed the suture is drawn taut, but is not tied, and the wound is flushed with a warm normal salt solution. Continuing from below upward with the same suture, the fascia is united with a second row of sutures covering up the other. When the upper angle is reached the suture is drawn taut and cut without being tied, as this is unnecessary. It will thus be seen that but one knot is made in this buried suture, and that is one which will not long resist absorption as the ordinary knot will, an advantage which cannot be overestimated.

While inserting the suture which unites the peritoneal layer, and especially after the protecting gauze pad is withdrawn, it will be well to keep the silkworm gut sutures drawn taut, so as to avoid catching under any of them a loop of intestine or omentum. After the fascia has been united and the unused end of catgut suture cut short, the deep silkworm sutures are tied from above downward. An assistant grasps all the ends on one side in one hand and those on the other in his other hand, and, drawing upon them evenly, lifts up the abdominal wall so as to free the loops which penetrate the peritoneal cavity from the intestines beneath. He holds them in this position, passing one at a time to the operator while they are being tied. Before tying each suture the pressure clamps are detached from its ends. A surgeon's knot is made, making two turns

*The advantage of including the muscular layer with the peritoneum is that it obviates leaving a space between them as is done when the peritoneum is sutured separately.

at first, and it is tied three times to make it firmer. As each knot is tied an assistant carefully coaptates the margins of the skin surface, and prevents overriding or turning in of the edges. If the sutures have been inserted near enough to each other, perfect coaptation of the skin margins will be secured without using intermediate, superficial sutures,

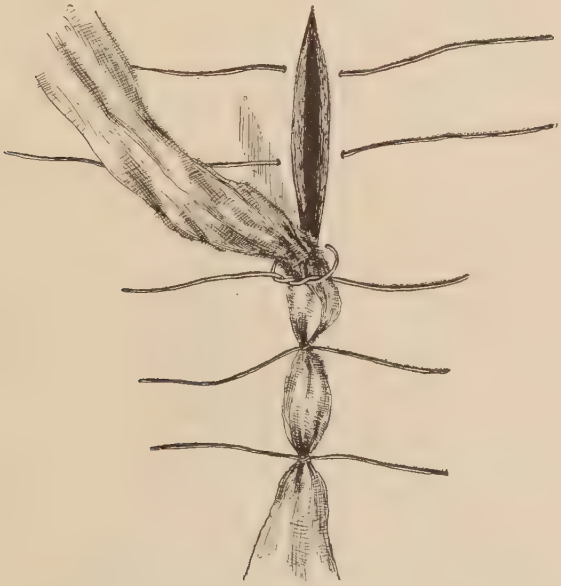


Fig. 65. Showing method of tying interrupted sutures over strip of gauze to avoid scarring by sutures cutting the skin.

but an extra suture may be required here and there and at the angles. For these the fine chromicized catgut is used. When all the silkworm gut sutures are tied the ends are cut off three-quarters of an inch to an inch from the knot.

To obviate cutting of the skin by these interrupted deep sutures, and the consequent cross scarring, a narrow strip of iodoform gauze, folded in several thicknesses, may be placed lengthwise of the incision, and the sutures are tied over this. (See Fig. 65.)

The subcuticular suture of Marcy inserted after the lay-

ers beneath have been united by suture is appropriate where the abdominal wall is not too fat. The resulting scar is scarcely noticeable. The method of inserting it is shown in Fig. 66. The ends are not tied, but left long.

The surface of the abdomen is now sponged off to remove blood, and a dry, sterilized towel or pad is placed over the wound and held there while the sheet and towels are removed from about the patient and she is prepared for the final dressing. The wound is now covered with dry markasol, enough being put on to completely bury the suture ends. Over this there are then placed several pads

FIG. 66. Showing method of closing the skin margins by subcuticular suture of fine catgut.

of sterilized gauze, covering it completely, and over this a thick layer of sterilized absorbent cotton. This is held in place by broad strips of adhesive plaster (from three to five, according to the length of the wound), which are drawn tight and pass around behind, nearly encircling the body.

Over this is placed another layer of absorbent cotton and the bandage is applied. Besides serving to keep the dressing in place the adhesive strips prevent strain on the sutures and wound during the subsequent efforts at vomiting or coughing.

The many tailed bandage can be applied more evenly and affords better support to the abdomen than the ordinary obstetric binder, and is for this reason more frequently used. Either will require a peritoneal binder pinned back and front to keep it from slipping up. The abdominal bandage may be changed when required without disturbing the dressings on the wound.

The dressings are not disturbed for a week unless something unexpected occurs to demand it. Then the cotton and gauze are removed, and if the powder is still dry it is not disturbed, but a little more may be sprinkled on and fresh gauze applied. This is permitted to remain for another week, when the powder is brushed off and the silkworm gut sutures are removed, if there exists no necessity for leaving them longer. The surface is then covered with the same powder, and the gauze and the cotton dressings again applied. It is not washed off until a week later, when this dressing is again removed. Then, if every part is healed, the dressing is not renewed, but simply a thick layer of absorbent cotton is placed over the eschar under the bandage, which should be worn for some time.

CHAPTER XIII.

VENTRAL SUSPENSION OF THE UTERUS.

Ventral suspension and ventral fixation are not to be confounded. Ventral fixation as ordinarily practiced consists in fixing the anterior face of the uterus by a more or less broad attachment to the anterior abdominal wall, to which it becomes adherent and permanently fixed. In order that the fixation may become more certain and permanent the peritoneal surfaces, both on the uterus and abdominal wall, are sacrificed. This procedure leaves the uterus fixed, as its name implies, in an unnatural position, out of the pelvis, and pregnancy occurring subsequently must undoubtedly be interfered with. (Fig. 67.)

FIG. 67. Position of the uterus in ventral fixation.

Ventral suspension consists in attaching the posterior face of the fundus of the uterus to the anterior abdominal wall at the lower angle of the incision, by two permanent sutures of silk placed so closely together as to obtain a very

limited surface of attachment. These sutures include the peritoneum and subperitoneal fascia of the abdominal wall and the peritoneum and a few muscular fibres of the uterine fundus. As a result, the uterus is at first held closely against the abdominal wall, and adhesion takes place between the two attached peritoneal surfaces. (Fig. 68.)

FIG. 68. Showing position of attached uterus in ventral suspension Immediate result.

But the surface of attachment is small and it is on the posterior face of the fundus, consequently the uterus is tilted forward. The intra-abdominal pressure when subsequently exerted is against the posterior face of the uterus and pushes it forward and downward, and the two peritoneal surfaces pull out, permitting the uterus still attached to sag away from the abdominal wall. This increases when the patient resumes the erect position, the two peritoneal folds stretching out into a band about an inch in length, which becomes firm from age. The result is, therefore, that the uterus is suspended from the abdominal wall and

swings in an easy anterior position, being fairly movable. (Fig. 69.) Subsequently pregnancy is not interfered with, because the organ is movable and the suspending band or artificial ligament develops and lengthens out as pregnancy advances.

Fig. 69. Ultimate result in ventral fixation.

The operation is only done for retrodisplacements which have become irreducible in consequence of surrounding adhesions. When the uterus is movable and can be replaced, another procedure, to be described later on, is to be adopted. It may be done also for prolapsus of the uterus in conjunction with repair of the pelvic floor, when this is necessary. Likewise, when from any cause both appendages have been removed and the uterus is left, being thus deprived of the support of the broad ligaments, the uterus should be suspended from the anterior abdominal wall.

The operation is as follows, viz.: The patient having been prepared in the same manner described under the head of "Making and Closing the Cœliotomy Wound," the uterus is carefully curetted as an auxiliary measure to overcome any existing endometritis.* This done, an incision not more than two or two and a half inches in length is made in the median line of the abdomen, ending an inch above the pubis. When the peritoneal cavity has been opened, the index and middle finger of the left hand are inserted through the wound and down into the pelvis, carefully pushing the coils of intestines up to get beneath them. Upon reaching the uterus the fingers are swept around behind and beneath the fundus, separating the adhesions which bind it down in Douglas's *cul de sac*. When freed all around the fundus is lifted up with the fingers and brought forward into the abdominal wound, where it is seized with a pair of angular tenaculum forceps and held in place firmly. The appendages are now examined with the same two fingers, running them down on each side, one in front and the other behind the broad ligament, and when necessary, the tube and ovary are brought up into the wound for inspection. If found to be sufficiently diseased to require removal they are excised in the manner to be described under the head of oöphorectomy. Or when it is feasible a conservative operation may be done to preserve their functions. This work completed, we proceed to suspend the uterus.

The peritoneum on each side near the lower angle of the incision is seized with pressure forceps and drawn out. A small curved needle is used, threaded with No. 7 silk. The first suture is inserted, first upon the peritoneal surface near the lower angle of the incision, a half an inch from its edge on the left, including the peritoneum and subperitoneal fascia, but not deep enough to include any of the muscular layers of the abdominal wall. (Fig. 70.) The needle enters on the peritoneal surface a half an inch from

*For technique of currettage and indications for gauze packing, see chapter on technique of currettage.

the margin of its divided edge and emerges on the peritoneal surface also, a quarter of an inch from the point of entrance outward from the median line. The suture is drawn through, and the needle is next inserted upon the posterior part of the fundus of the uterus as it presents in the wound, exactly in the center, including the peritoneum and muscular fibres, to the depth of an eighth of an inch and a breadth of half an inch between its entrance and exit. The suture is then drawn through, and the needle is again inserted upon the peritoneal surface on the right peritoneal

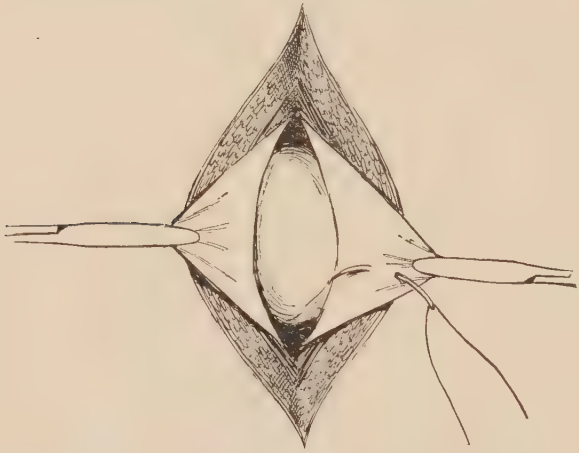


Fig. 70. Peritoneum drawn out and needle inserted for first suture.

flap at a point opposite that on the left, and including the same depth and breadth of tissue. The suture is drawn through, the needle released, and the free ends of the suture are clamped with a pair of pressure forceps. A second suture is inserted in a similar manner a quarter of an inch above the first on the peritoneal surface of the abdominal wall of either side and a quarter of an inch behind the first suture on the posterior aspect of the fundus. These sutures are now tied, the lower one first, and the tenaculum forceps are removed. When this is done the uterus is held securely

in the lower angle of the incision against the abdominal wall just above the bladder, and is tilted slightly forward because of the location of the sutures on the posterior aspect of the fundus. The intra-abdominal pressure is therefore directed against the posterior face of the fundus.

In closing the abdominal wound the deep silkworm gut sutures at the lower angle are inserted through the peritoneal margin of each side near the attachment sutures, and in such a manner as to prevent strain upon the uterine sutures and to avoid sagging and stripping of the peritoneum from the abdominal parietes before union takes place.

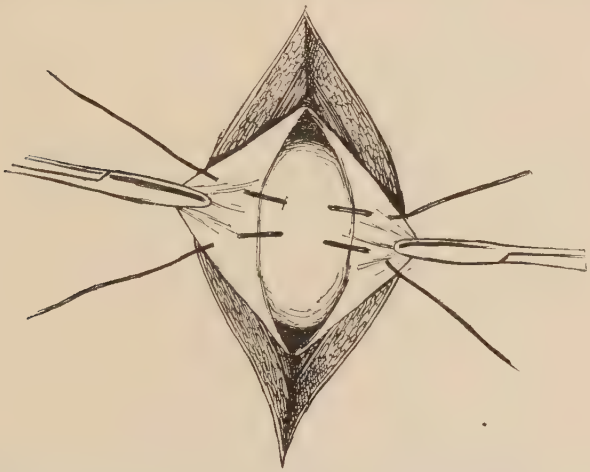


FIG. 71. Both suspension sutures inserted through peritoneum and uterine fundus.

Care must be taken to avoid catching a loop of intestine or omentum between the uterus and abdominal wall when tying the suspension sutures.

In uniting the peritoneal margins with the continuous sutures the uterine or suspension sutures are covered over completely and closed in the peritoneal cavity. These uterine sutures are therefore tied in the peritoneal cavity and not in the abdominal wound. This is much safer, as they

soon become encysted and give no trouble when left wholly within the peritoneal cavity; whereas, if tied in the wound they may subsequently become infected and must then be removed.

In other respects the abdominal wound is closed in the manner described under that head. The deep silkworm gut sutures are not removed for two weeks, and the patient is confined to bed for three weeks. She is urged to avoid for several months anything which would produce undue strain upon the newly attached uterus. This is the rule when the abdominal wound heals promptly, which should be the case in every instance; but should there be any delay in the healing the patient must be confined to bed for a longer period.

This operation *per se* is practically without mortality when done under the proper aseptic precautions, that is, independent of any disease of the appendages which may complicate the condition demanding it.

CHAPTER XIV.

EXTRA-ABDOMINAL SHORTENING OF THE ROUND LIGAMENTS.

This operation is appropriate only where the retroflexed or retroverted uterus is freely movable, not adherent, and is readily held in correct position by a vaginal pessary. It should never be undertaken until the displacement has been completely overcome by preparatory treatment and a vaginal pessary has been fitted, which will correct the malposition. This is particularly important because the auxiliary support of the pessary is needed subsequently to the operation to lessen the strain upon the newly attached round ligaments, while the patient is confined to bed afterwards, and the uterus tends to gravitate backwards. After she resumes the erect position, and the intra-abdominal pressure is exerted normally against the posterior face of the uterus, tilted forward, this auxiliary support is not required and the pessary may then be dispensed with.

The object of the operation then is to cure permanently a retro-displacement of long standing, which, owing to permanent relaxation of the supports, is only temporarily overcome by the pessary, and is otherwise incurable. Deprived of this means of cure, these patients are doomed to wear the pessary throughout their lifetime.

There is another class of cases where the pessary cannot be worn with any degree of comfort; in fact, produces serious discomfort by pressure upon prolapsed, enlarged and sensitive ovaries, and in these cases this operation is unquestionably called for. When for any reason these displacements are complicated by diseased ovaries which require removal, they are removed first, through a vaginal incision posterior to the cervix, opening into Douglas's *cul de sac,* and the operation for shortening the round liga-

ments is done afterwards, at the same time, or subsequently, as the operator may elect.

The chief drawbacks to the operation for shortening the round ligaments as ordinarily done by an incision at the external ring are:

1. The difficulty experienced in finding the ligaments.
2. The small size of the ligament at that point.
3. The length of time required to complete the operation.
4. The length of the incision.
5. The necessity of laying open the inguinal canal, incurring:
6. The risk of hernia.
7. The failure to obtain primary union, owing to the unavoidable handling and bruising of the tissues and the destruction of nutrient vessels.
8. The disfiguring cicatrix.

The operation I shall describe, which has been popularized by Dr. J. K. Kellogg, consists in making a small incision, not more than an inch long, over the internal ring, through the skin and underlying fascia, down to and exposing the external oblique muscle, then retracting the lower edge of the incision sufficiently to expose the upper border of Poupart's ligament, and penetrating the roof of the inguinal canal just above it with a small incision the length of a narrow knife-blade, just sufficient to insert a blunt hook and fish out the round ligament. At this point the ligament is much larger and is more readily found.

The advantages of this operation over the other method of shortening the round ligaments are, viz.:

1. The ligaments are not cut or detached.
2. The inguinal canal is not laid open and it leaves no liability to hernia.
3. The ligament at this point (the internal ring) can always be found and is strong enough to bear shortening and sustain the uterus.
4. The operation can be more quickly executed, requiring not more than from eight to ten minutes for each side from start to finish.

5. The ligament is buried in succulent muscle, which provides ample nutrition.

6. The attachment is secure and does not give way.

7. Primary union is always secured.

8. It does not require more than an inch incision through the skin, and not more than a quarter of an inch incision

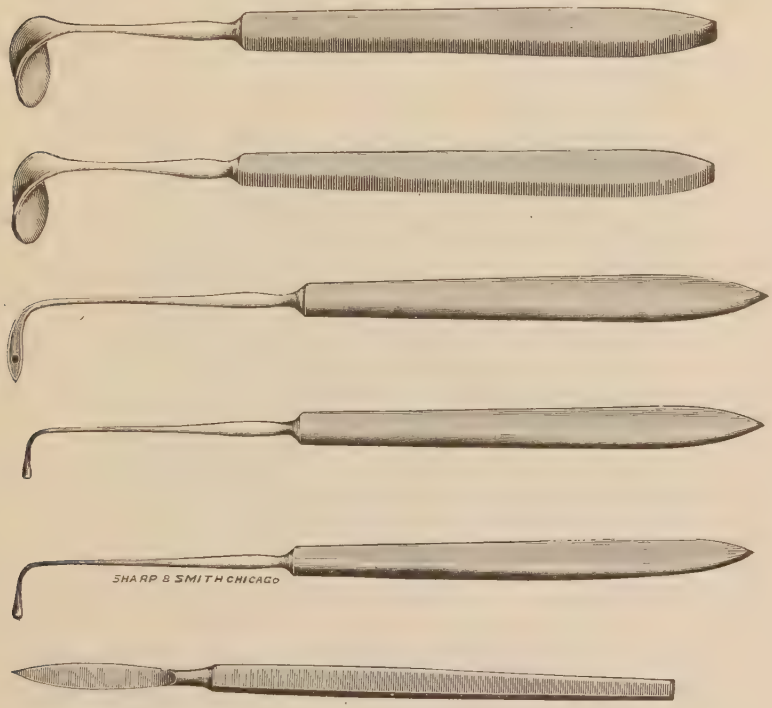


FIG. 72. Kellogg's set for shortening the round ligaments.

through the muscular roof of the inguinal canal.

9. No disfiguring scar remains.

Two assistants, besides the anæsthetizer, and a nurse are required. The first assistant must give his undivided assistance to the operator, holding and manipulating the retractors. The second assistant must attend to the instruments. He must have needles threaded and ready to pass

to the operator at the proper time without delay; and he must anticipate the operator's every want.

The technique of the operation is as follows, viz.:

The pubis is shaved and the surface of the abdomen prepared as carefully as for an operation within the peritoneal cavity, to secure absolute asepsis, that is, after thorough washing, a soap plaster is applied for twelve hours, then the surface is scrubbed again with green soap and a nail brush and washed off with ether, after which it is dressed

Fig. 73. Location of incision on one side.

with markasol gauze, which is not removed until the patient is placed on the operating table.

The uterus is always submitted to a thorough curettage first to overcome the endometritis, which invariably exists. This aids materially in reducing the size and weight of the organ, which lessens the strain upon its external supports. The maintenance of the uterus at a proper plane in the pelvis by shortening the ligaments accomplishes the rest by restoring its normal circulation and nutrition.

The operator standing on the right, facing the patient, the internal ring is now located at a point midway between the anterior superior spine of the ilium and the symphysis

pubis on one side, and an incision from this point downward, parallel to Poupart's ligament, an inch long, is made through the skin and superficial fascia. (Fig. 73.) To avoid dividing the superficial vessels, which sometimes cross the line of incision, the preservation of which is important on account of the limited blood supply of this part of the abdominal surface, two blunt hooks are inserted into the wound by the operator, and they are drawn to one side toward either angle of the incision. The assistant now inserts two retractors in the manner shown in Fig. 74, holding the edges of the incision apart and the vessels out of

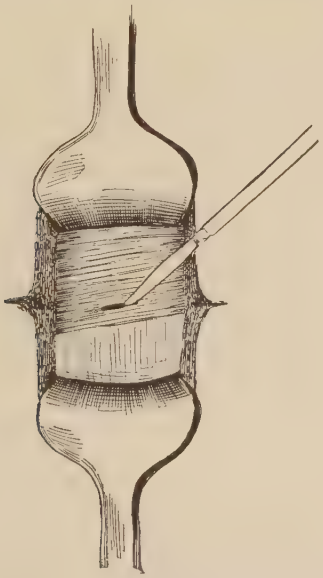


Fig. 74. Showing retractors in position and incision in roof of inguinal canal just above Poupart's ligament. Left side.

the way. Then the blunt hooks are removed and the deeper fascia is divided down to the sheath of the external oblique muscle. The retractors are now readjusted so as to include the fascia also. Next the assistant retracts the lower edge of the incision until Poupart's ligament is fairly

exposed. The operator then makes an incision with a narrow bladed knife not more than a quarter of an inch long just above the upper border of Poupart's ligament, in the direction of the fibres of the external oblique, opening into the inguinal canal which lies immediately beneath the muscle, forming its roof. This incision is never more than a third of an inch deep, and seldom more than a quarter of an inch long. (Fig. 74.) The operator now

Fig. 75. Round ligament drawn out, hooked on blunt hook and secured by ligature grasped with pressure forceps.

inserts the blunt hook through the incision into the canal, directing the point upward and inward toward the median line, catches the round ligament and draws it out. The ligament will usually be found very easily just above the line of incision into the roof of the canal imbedded in loose fat which fills the canal. This fat immediately beneath the roof of the canal is one of the guides to the operator, showing the canal has been penetrated into. The ligament is drawn out, looped upon the blunt hook, and, as it is withdrawn, it is stripped of its accompanying nerve and vessels and the pouch of peritoneum, which sometimes pulls out at the internal ring, clinging to it. The greatest care is observed not to handle the ligament and to avoid bruising it,

as it is poorly nourished tissue and prone to slough when roughly handled. It should never be grasped with forceps.

When a sufficient length of ligament has been drawn out, a stout silk ligature is passed through the loop and caught close to it with a pair of hemostatic forceps (Fig. 75). The retractors are now removed and the first suture for securing the ligament and the upper one of the two used for closing the wound is now inserted. (Fig. 76 and Fig. 77.) A medium long, curved needle, threaded directly

FIG. 76. Round ligament drawn out to full extent, and first suture inserted with pressure forceps attached to each end.

with a strand of silkworm gut, is inserted upon the skin surface above, near the margin of the skin incision, a quarter of an inch away, penetrates the skin, then the muscle near the margin of the incision in the muscle covering the canal, then the thick part of the round ligament as it emerges through this incision, next the muscular margin of the incision below, and emerges on the skin surface below the incision, at a point opposite its insertion above. The ends of this suture are caught with pressure forceps, and it is not tied until the second suture has been inserted. (Fig. 77.)

The next step is to secure the ligament by burying it beneath the fibres of the external oblique muscle and introduce the second suture. A rectangular blunt needle resembling an aneurism needle, with the eye near its point, threaded with a stout silk ligature, is employed for burying the ligament. The assistant retracts the upper margin of the skin incision sufficiently to expose at least an inch of the

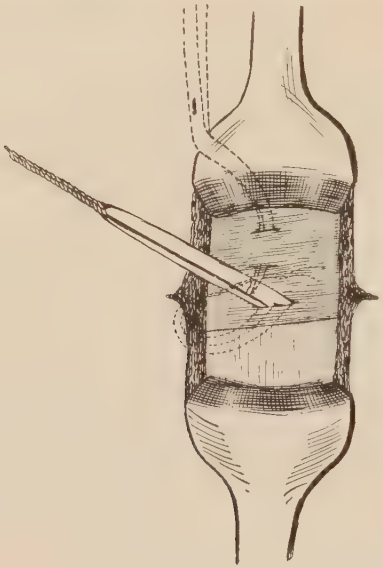


Fig. 77. Showing method of carrying loop of round ligament under fibres of external oblique muscle. Left side.

surface of the external oblique muscle above the line of incision through the skin, then this ligature carrier is inserted under the belly of the muscle, at least an inch above the incision, and its point carrying the ligature is made to emerge about a quarter of an inch from the upper margin of the small incision through the roof of the inguinal canal, through which the round ligament has been drawn. The assistant hooks up the ligature near the eye of the ligature carrier, and forms a loop through which is passed the ligature holding the loop of round ligament (Fig. 78). The

hemostatic forceps securing it near the ligament are now removed, and holding the free end of this ligature, the ligature carrier is withdrawn, carrying with it under the belly of the muscle the ligature which secures the loop of the round ligament. With this the loop of round ligament is drawn through the belly of the muscle. (See Fig. 79.)

The second suture of silkworm gut is now inserted near

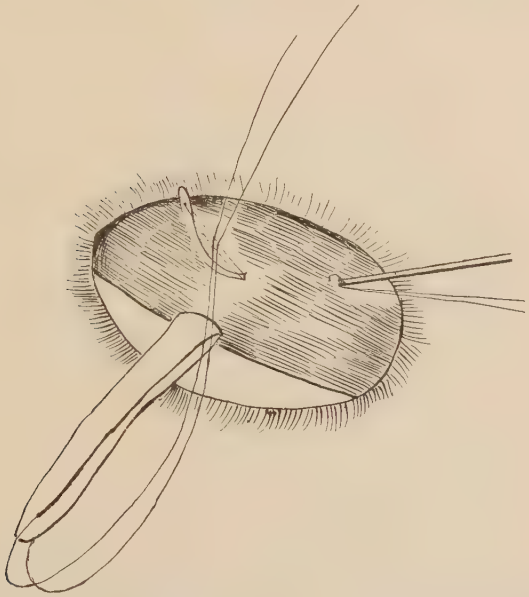


FIG. 78. Aneurism needle penetrating the external oblique muscle and engaging the ligature securing the loop of round ligament. Right side.

the lower angle of the incision, a quarter of an inch from the margin, penetrates the skin, then the thicker portion of the round ligament, as it emerges from under the external oblique muscle above, then the muscular margins of the incision through the roof of the inguinal canal at its lower angle, then it catches the free loop of the round ligament which has been folded down across the wound, and emerges through the skin below at a point opposite its insertion above. (See Fig. 80.) This suture secures the free loop

of round ligament and assists in closing the incision in the roof of the inguinal canal, as well as the external incision through the skin.

The loop of round ligament (Fig. 80) is folded down across the base of the wound and is caught by the second

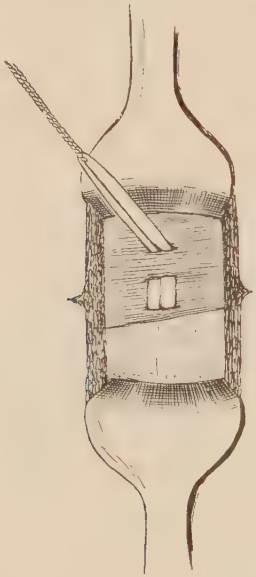


FIG. 79. Round ligament looped under the the external oblique muscle. Left side.

suture at the point marked A, just before it emerges through the skin. This could not be shown in the drawing.

The wound is next flushed with normal salt solution and the sutures are tied, the upper one first. These two sutures usually suffice for closing the incision perfectly. When necessary, however, a superficial suture of fine chromicized catgut may be inserted between them. The ends of the silkworm gut sutures are left long and are tied together, as shown in Fig. 81. This obviates the irritation which they provoke when the ends are cut short.

The same procedure is now repeated on the other side, the operator standing on the same side, the right of the patient, but facing the table at right angle, so as to make the incision from above downward.

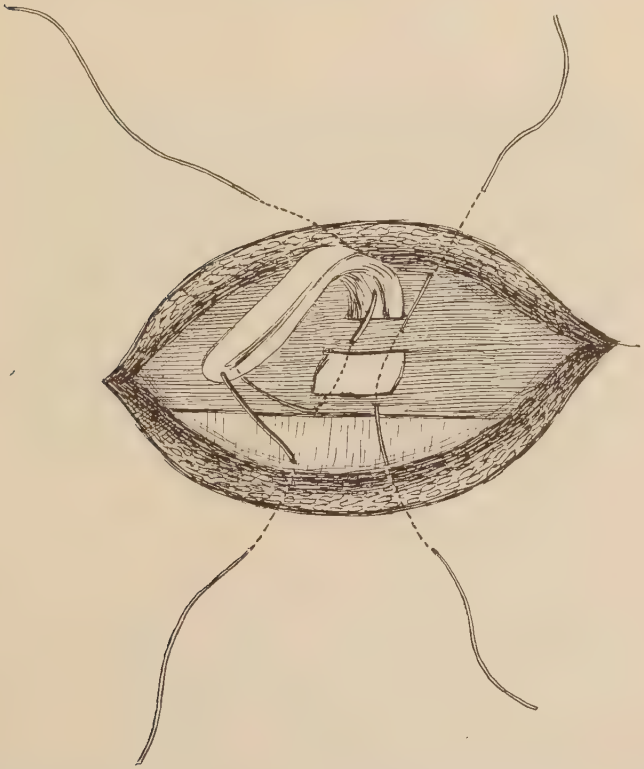


FIG. 80. The position of both sutures before they are tied. The second suture penetrates the free loop of the round ligament at A before it passes out through the skin. Left side.

The wounds are dressed with dry markasol, covering them completely. Over this is placed a pad of sterilized gauze, and another of cotton held in place by strips of rubber adhesive, and a roller bandage is applied over this, encircling the hips and both thighs. The wounds are left

undisturbed with this dressing for a week, unless the bandage and dressing become loosened. If this occurs the dressing is lifted up and a fresh supply of the powder is applied. The sutures are removed at the end of two weeks, after which the wounds are kept covered in the same manner for another week.

Fig. 81. The operation completed on both sides, showing the location of the wounds and the method of securing the suture ends.

While primary union is the rule, some direction is necessary in case it does not occur, or in case the suture tracks become irritated or suppurate. When this accident occurs the dry dressing must be supplanted by a moist dressing of iodoform gauze or plain, sterilized, moist gauze, which favors drainage, and this dressing must be continued as long as there is any discharge.

The patient is confined to bed for three weeks under favorable conditions of the wound. The pessary is not removed until two weeks later, when the attached ligaments may be considered strong enough to sustain the uterus without its aid.

This operation, done in the manner described, is practically bloodless, unless the superficial vessels are wounded accidentally; hence the nutrition of the parts is not ma-

terially interfered with and primary union is assured. By avoiding the handling of the round ligament its nutrition is not so much disturbed and sloughing is avoided. Burying the loop of round ligament under the external oblique muscle secures it more firmly, and provides abundant nutrition to sustain its vitality.

The time required for this operation depends largely upon the assistants as well as the operator. Rapidity in operating is attained only by efficient, well trained assistants and an expertness born of experience. It may be completed on both sides in from ten to twelve minutes from start to finish, that is, from the time the first incision is made to the tying of the last suture. A longer time may be required if the ligament is not readily found, but not more than fifteen to twenty minutes for both sides should ever be necessary. There is always an advantage in rapid surgical work when it is not done at the expense of thoroughness.

CHAPTER XV.

VAGINAL OVARIOTOMY.

When an ovarian cyst is small, not above the level of the umbilicus, is situated low in the pelvis so as to be distinctly felt through the vagina, and is not extensively adherent, it may be removed by vaginal section with less shock to the patient than by abdominal section, chiefly because it involves less exposure of the peritoneal cavity. Firm union of the incision occurs more quickly, and convalescence is more rapid, hence the patient is confined to bed for a shorter period. Under ordinary conditions, all things being equal, the operation involves less risk, and, as a rule, the patient will consent more readily to vaginal than abdominal section.

General Preparation of the Patient.—A week at least should be consumed with the preparatory treatment unless something in the patient's condition demands immediate operation. During this time the intestinal tract must be thoroughly cleared out, and intestinal distention must be removed by re-establishing, as nearly as possible, a normal condition of the digestive apparatus. A week is a short time in which to accomplish this, and in some cases a longer time will be required, but much may be done in this time if the patient is put upon a rigid non-fermentive diet, and at the same time is given copious draughts of hot water containing a small quantity of the bicarbonate or phosphate of soda three times a day an hour before meals, and the colon is flushed once a day with warm water rendered alkaline by the addition of soda.

Daily examinations of the urine should be made to ascertain the quantity voided, its specific gravity, and the presence or absence of albumen, sugar or bile, and unless operative interference is urgently demanded the operation

should be delayed until something near a normal condition of the urine can be brought about, and until the urine is free from the agents mentioned, especially bile. Unfortunately the presence of bile in the urine is too often overlooked or disregarded, which is strange, since it indicates a disordered state of the system unfavorable for the administration of anæsthetics and smooth convalescence. A careful analysis of cases submitted to operation when care has not been taken previously to eliminate bile from the urine by regulating the function of the liver and causing it to be discharged into the bowel in a normal manner, shows that the anæsthetic is not taken well; it creates more disturbance of the stomach and intestinal tract both during the operation and subsequently, and convalescence is seriously interfered with and prolonged. Hence during the period devoted to preparation for the operation it is well to give frequent doses of some active cholagogue, such as calomel, in addition to the hot alkaline draughts which act in the same manner.

Immediate Preparation of the Patient.—The evening before the operation the pubes, vulva and perineum are shaved and washed thoroughly with green soap. The vagina is scrubbed out also with green soap on a pledget of absorbent cotton held in the grasp of a pair of long-handled dressing forceps, and afterwards irrigated freely with a one per cent. solution of lysol. During this irrigation the vulva is compressed around the vaginal nozzle repeatedly so as to distend the vagina, then the pressure is suddenly relaxed, permitting the retained fluid to gush out. This is the most effectual manner of cleansing the vagina. Afterwards the vagina is filled loosely with markasol gauze, and a vulva pad of the same is applied and held in place by a T binder. The gauze is not removed from the vagina until the patient is placed on the operating table. If the urine is voided in the sitting position the vaginal gauze will not be soiled, but the vulva is irrigated afterwards with lysol solution and a fresh vulva pad is applied.

Instruments Required.—A broad, short-bladed, perineal retractor, of hard rubber.

A long-handled curved scissors with round, blunt points.
A long-handled curved scissors with sharp points.
Several long-handled broad ligament clamp forceps.
Half a dozen fenestrated sponge-holder forceps.
Two stout tenacula.
An angular tenaculum forceps.
Two long-handled dressing forceps.
A long-handled needle forceps.
Half a dozen quarter-curved needles, an inch and an inch and a quarter long.

In addition there will be required a leg holder to retain the patient in the lithotomy position, a rubber air pad with apron to protect the table, a spool of stout, strong pedicle silk which has been rendered sterile by boiling for at least half an hour, and catgut Nos. 1 and 2 prepared in formalin.

Preparation of the Patient on the Operating Table.—The patient when anæsthetized is placed upon the operating table with the buttocks well down over the edge, and the thighs are held flexed upon the abdomen by means of the leg holder. Sterilized canton flannel stockings are drawn on over the legs and tied above the knees. The pad is adjusted under the hips, the clothing being slipped up under the back above the pad, and a sterilized sheet is thrown over the chest, abdomen, and limbs.

The gauze is now removed from the vagina, and the vulva and anus are scrubbed again thoroughly with green soap, and the vagina is irrigated with a one per cent. solution of lysol. If the dressing forceps is used for washing out the vagina, it is put aside and not used again for any other purpose during the operation. A sterilized towel wrung out of hot lysol solution is placed over the lower part of the abdomen and pubes to protect the operator's hand from contact therewith and the surrounding parts or clothing while making bimanual examination previous to beginning the operation. Such an examination at this time should never be omitted, as so much additional information may be obtained with the patient relaxed and insensible. Before this examination is made a similar towel is also

stretched across the buttocks with its upper edge about on a level with the lower angle of the vulva, and this is fastened securely by pins to the clothing on each side. This serves to protect the examining hand from contact with the anus. This towel is retained in position throughout the operation and is changed as often as it becomes soiled, as it may be by the escape of fluid from the bowel.

Position of Operator and Assistants.—The operator sits facing the field of operation upon a conveniently low stool, with his feet upon a still lower stool on which rests the bucket for receiving the drainage from the table. A sterilized towel is placed across his lap for the reception of instruments which he may have occasion to place there for convenience during the operation.

The first assistant stands to the right of the operator, to the left of the table, and bends over between the limbs of the patient while assisting.

The second assistant stands to the right of the table, opposite the first assistant, ready to pass instruments and ligatures as required, from a table placed conveniently at his side.

The nurse sits on the left of the operator and holds the perineal retractor in her right hand. Previous to grasping the handle of the retractor she wraps a sterilized wet towel about her hand and forearm, which is bared to the elbow.

Technique of the Operation.—The perineal retractor is inserted into the vagina well back behind the cervix, which is seized by its posterior lip with an angular tenaculum forceps and drawn down within easy reach. The cervical canal is then wiped out thoroughly with a pledget of absorbent gauze held in the grasp of long-handled dressing forceps, and afterwards it is packed with markasol gauze. A traction ligature is then passed through both lips of the cervix which, when tied, closes the cervix over the gauze packing in the canal, very effectually excluding all chance of infection from that source. This traction ligature takes the place of the tenaculum forceps, which is removed.

The cervix is drawn well down and up against the base

of the bladder, and an incision is made with curved scissors at the cervico-vaginal fold, posterior to the cervix, extending about half way around on each side. This incision penetrates the vaginal wall and into the cellular tissue beneath. Hugging the posterior wall of the uterus it is extended upward by dissection with the fingers or the blunt scissors closed until the peritoneal fold of Douglas's pouch is reached. This fold is severed with a few strokes of the scissors, and the incision is extended to the limit of the vaginal incision on each side, opening the peritoneal cavity. Sometimes there will be considerable hemorrhage from the severed vessels of the vaginal wall during this dissection, but it will be waste of time to attempt to check it until the peritoneal cavity is opened. The posterior edge of the peritoneum of Douglas's pouch is caught with a tenaculum and drawn down to the posterior edge of the incision in the vaginal wall, and these two edges are united by a temporary continuous suture of catgut extending from the angle of the incision on one side to that on the other. This very effectually controls the bleeding, leaving the field of operation clear.

The tumor is now forced down by pressure above on the hypogastrium with one hand, while two fingers of the other hand are inserted through the incision into the peritoneal cavity alongside of the tumor and swept around it, separating any adhesions encountered. This done, the assistant makes pressure on the abdomen in the same manner, crowding the tumor down into the incision, where it is held firmly, while the operator punctures and empties the cyst. A broad ligament clamp-forceps is plunged into the cyst with blades opened, so that one blade penetrates the cyst, while the other slips up along the outside of the cyst wall. The moment the cyst wall is penetrated the handles of the forceps are brought together, closing them and catching the cyst wall. The collapsed sac is drawn down through the incision into the vagina while the cyst is emptying itself. When the vagina has been cleared of the fluid, the major part of which flows out along the groove of the perineal

retractor, the index finger is passed up alongside the sac through the incision and is swept around, separating any adhesions brought within reach after collapse of the sac. Usually the adhesions are few and easily separated in a case of this kind when the tumor has not been previously punctured or otherwise interfered with. The whole sac is drawn through into the vagina, exposing the pedicle in the incision. This is drawn down as far as possible and ligated as here described.

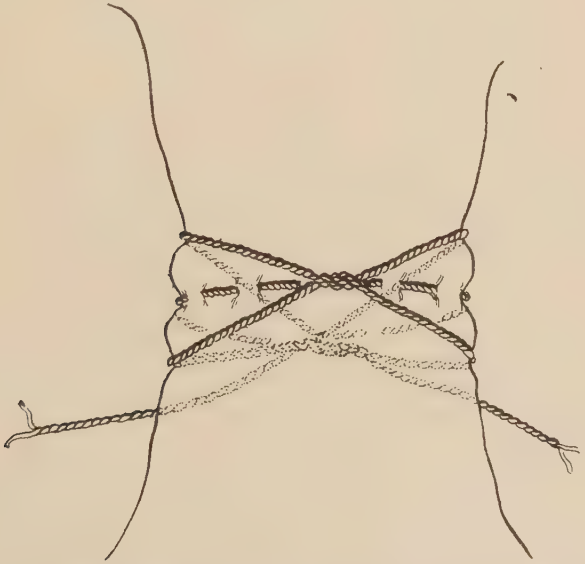


FIG. 82. Showing method of ligating the stump to prevent slipping of the ligature. See text for description of its application.

As it is not possible to inspect the stump of the pedicle after it has been returned into the peritoneal cavity and traction and pressure upon the vessels have been released, the ordinary method of transfixing and ligating the pedicle cannot be considered always safe. After having the ligature slip in one case, which happily was remedied immediately, I have adopted the method of ligating here described, which precludes the possibility of such an accident.

The ligature is threaded in a short quarter-curved needle with a large eye and quilted around the circumference of the pedicle, as represented in the accompanying illustration. The needle is then detached and the ligature is tied once tightly with a double turn, to prevent slipping. The ends are then brought around on the outside of the pedicle above the quilted portion and tied firmly twice with a surgeon's knot. Then they are carried around below the quilting and tied again in the same manner. If silk is used and it has been carefully sterilized, it is perfectly safe to leave it in the peritoneal cavity. The pedicle is divided a quarter of an inch below the ligature. The ends of the ligature are not cut off until the sac has been removed, when the stump may be inspected previous to returning it into the peritoneal cavity.

If at any time during the operation the intestines threaten to protrude through the incision, a pad of absorbent gauze with a stout silk ligature attached securely to its center is passed up through the incision into the peritoneal cavity by means of a pair of fenestrated sponge-forceps. Care must be taken to keep the ligature end out of the way and not lose it within the cavity during subsequent manipulations. This tampon is removed, of course, before the incision is closed, and it is best to remove it before the stump is returned.

If there is any necessity for drainage, which is seldom the case, the vaginal incision is not closed. The temporary suture uniting the peritoneum and the posterior vaginal wall is not then removed. The return of the organs to their normal position permits the two peritoneal edges to come together, and union takes place rapidly. It will even be necessary to insert a strip of gauze through the incision, to prevent too early union, if prolonged drainage is required. If it is decided to close the vaginal incision, the temporary suture uniting the peritoneum and vaginal wall is removed, and a continuous suture of catgut, including both peritoneal and vaginal edges, is introduced, bringing the several tissues into apposition.

The traction ligature and gauze in the cervix are now removed, and the vagina is sponged out dry and filled loosely with moist markasol gauze to absorb the oozing. This is done whether the incision is closed or left open for drainage.

The after-management of these cases is exceedingly simple. The gauze is removed from the vagina after forty-eight hours and is not renewed. If any vaginal discharge develops during convalescence, the vagina is irrigated as often as necessary with a solution of markasol or permanganate of potash, otherwise vaginal douches are not employed.

The bowels are moved on the second day and thereafter as required. As soon as the stomach has recovered from the effect of the anæsthetic, solid food may be given, in small quantities at first. Convalescence proceeds without interruption. The patient is confined to bed for two weeks at least.

CHAPTER XVI.

ABDOMINAL OVARIOTOMY.

Ovariotomy, in the ordinary acceptation of the term, implies the removal of an ovarian tumor which is usually cystic and has attained considerable size, but does not apply to the removal of diseased ovaries, though such ovaries may be increased greatly in size. The latter operation is designated oöphorectomy. In describing the technique of ovariotomy it will be understood then that it applies only to the removal of cystic tumors of the ovary which have a distinct pedicle, and cysts growing between the folds of the broad ligament are deferred to another heading.

Ovariotomy is to-day a simple operation under ordinary conditions, and one which *per se* involves little risk when done by an expert surgeon who would, of course, operate only under strict aseptic conditions. It is unusual to encounter many or serious adhesions, and these tumors are not permitted now to attain a very great size before they are removed, nor are they subjected to tapping, as was the case some years back. Therefore, the mortality attending their removal has been greatly lessened, and it is now so little that it is not considered as an element in influencing a decision for operative interference.

Thorough preparation of the patient is a very essential prerequisite, and influences materially the rapidity with which the operation may be executed and the result as well. From a week to two or three weeks may be well spent in regulating the digestion and getting the alimentary canal in good working order, so as to remove intestinal distention which often proves a serious impediment during an abdominal operation when this preparation is disregarded. This is the more important if the patient's health is much impaired or she is well advanced in years, for the preparatory treatment serves to reinforce her exhausted energy

and fortifies against the shock which an operation of this character necessarily entails.

The immediate preparation of the patient and of the operating room, as well as the duties of the assistants and nurses, was gone into so thoroughly under the head of making and closing the cœliotomy wound that a repetition here would be superfluous. The reader is, therefore, referred to that chapter.

The instruments required in ovariotomy are few, and a multiplicity of instruments at any operation is very much to be discouraged. Yet it is well for the surgeon to be prepared with such instruments as may be required in any emergency which may arise, and not be taken unawares. For instance, he must be prepared to suture a wounded intestine or do an intestinal anastomosis, and such appliances as would be necessary for this purpose should be at hand, though they need not necessarily be displayed on the instrument table to add to the confusion, or for effect upon the bystanders.

The instruments actually required are a scalpel for opening the abdomen, two thumb forceps, one pair of stout, long-handled, blunt scissors, a dozen hemostatic forceps, two small broad ligament clamps, two large broad ligament clamps, one special curved aneurism needle, or one ligature carrier, half a dozen of sponge-holders, a pair of reliable needle forceps, half a dozen of large quarter-curved needles for inserting the silkworm gut sutures in closing the abdominal incision, a spool of stout, loosely twisted Chinese pedicle silk (sterilized), which cannot be broken, No. 1 chromicized catgut, and silkworm gut.

This is not a formidable array, yet it is quite sufficient, and frequently half the number may be omitted. It was formerly customary to add a broad, flat, grooved director for dividing the peritoneum, but this is never used now, also a large male sound was once considered the proper thing for separating adhesions, and a trocar was thought to be necessary for tapping and emptying the cyst, but it is now seldom used.

Sponges have been entirely supplanted by sterilized gauze pads made of several layers of gauze folded and sewed together, care being taken to have no loose or frayed ends exposed, and small artificial sponges for the sponge-holders made of a round wad of absorbent cotton covered with two or three layers of gauze, the ends of which are drawn together on one side, tied, and sewed firmly. These are prepared for every case and are thrown away after the operation. They are never used a second time. At least half a dozen of the flat pads, varying in size from 4 x 4 to 8 x 10, should be ready in hot sterile water, and there should be more in reserve, and half a dozen of the smaller ones attached to the long-handled sponge-holders, or sticks, as they are sometimes designated.

The length of the incision is immaterial so long as it does not extend beyond the umbilicus. It should never be made unnecessarily long, yet it should be sufficient for easy and rapid work. Ordinarily the incision should be long enough to easily admit the operator's hand, which is inserted to separate the adhesions and to decide the character and location of the pedicle.

The greatest care should be exercised in entering the peritoneal cavity, both to avoid wounding a loop of intestine which may lie adherent across the front of the tumor and in the line of incision, and to avoid opening into the tumor sac, causing leakage into the peritoneal cavity. The incision is made usually in the median line from above downward, though if the abdominal wall is thin, very much stretched out and weak, it is better to make it to one side through the muscular layers so as to secure better union and a stronger cicatrix.

The operator stands on the right of the operating table, facing the patient, and his first assistant on the left, facing him. Grasping the abdominal wall with his left hand he calculates its thickness and decides how deep it is safe to make his first incision. Spanning the median line just below the umbilicus with his left hand, drawing the skin tense, he makes a straight incision with one stroke from the

point selected above to within an inch of the upper border of the symphysis pubis. The incision usually divides the skin and fat down to the linea alba, which is divided carefully with a second stroke of the knife from above downward as before. Care is necessary here, particularly if the abdominal wall is thin, for when there is absence of fat the peritoneum lies immediately beneath, with apparently nothing intervening. If there is any bleeding the vessels are clamped with hemostatic forceps, which are placed flat on the abdomen to either side of the incision, before proceeding to open the peritoneal cavity. The operator now takes a pair of thumb forceps in his left hand, and seizing the tissue at the bottom of the incision in the center lifts it up, while his assistant seizes with the other thumb forceps the tissue about a third of an inch away to the opposite side of the bottom of the incision. This lifts the peritoneum of the abdominal wall away from the tumor, and by moving the two from side to side it can be readily determined if it be free or adherent to the tumor. If free, the operator divides carefully the tissues between the points of the two thumb forceps with the scalpel. If it is found that the peritoneum is adherent to the tumor, a point is selected higher up in the incision where it may be free. As soon as the peritoneal cavity is opened he inserts the index finger of his left hand, sweeps it around to free adhesions which he may find, and to lift the peritoneum from the tumor so that the opening may be enlarged. Directing the finger upwards, he divides the peritoneum up to the limit of the incision above with the long-handled blunt scissors, passing one blade under it along the finger as a guide. He then directs the finger or two fingers downward towards the lower angle of the incision, and divides the remaining peritoneum in a similar manner down to the limit of the incision below. The left hand is now inserted and made to sweep all around the tumor, separating adhesions where found, when they are not too firm, and this can be done thus blindly without incurring injury to adherent intestines. When firm adhesions are encountered it is safer to delay

their separation until the fluid has been evacuated and the collapsed sac can be drawn out, so that sight may be utilized and we may work more safely.

The patient is now turned over on one side, preferably away from the operator, and the assistant compresses the abdomen from above on each side so as to force the tumor into the incision. With the scalpel it is quickly incised by the operator, and the edge of the incision is caught with a

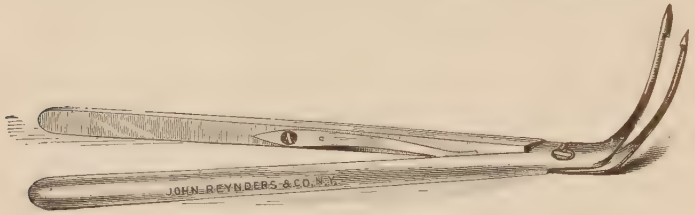


FIG 83. Author's ligature carrier.

pair of long hemostatic forceps or a small broad ligament clamp, with which the sac is drawn out through the abdominal incision as it collapses, to avoid escape of the fluid into the peritoneal cavity. The assistant keeps the intestines from escaping by placing flat pads on either side of the tumor and crowding them in alongside of it. As soon as sufficient fluid has escaped to permit the easy delivery of the tumor, the rent in the sac is closed by clamping it with a pair, or, if necessary, two pairs, of broad ligament clamps, and the patient is turned again on her back.

The pedicle may now be readily reached if there remain no adhesions with the intestines to be detached. This is ligated with a double ligature of stout silk carried through its center and tied on either side in the following manner: A ligature carrier, Fig. 83, is made to transfix the pedicle in its center as low down to its attachment as possible, the blades are separated (see Fig. 84), the assistant inserts the center of the ligature, which is about two feet long, between them, and the instrument is withdrawn, pulling the ligature loops after it. (See Fig. 85.) The loop is now divided and the ends crossed. One end with the corre-

sponding free end is given to the assistant to hold on one side of the pedicle, while the others are drawn around the other side by the operator, who tries them firmly with a surgeon's knot. The free ends are clamped with hemostatic forceps, and he next ties the other two ends which were

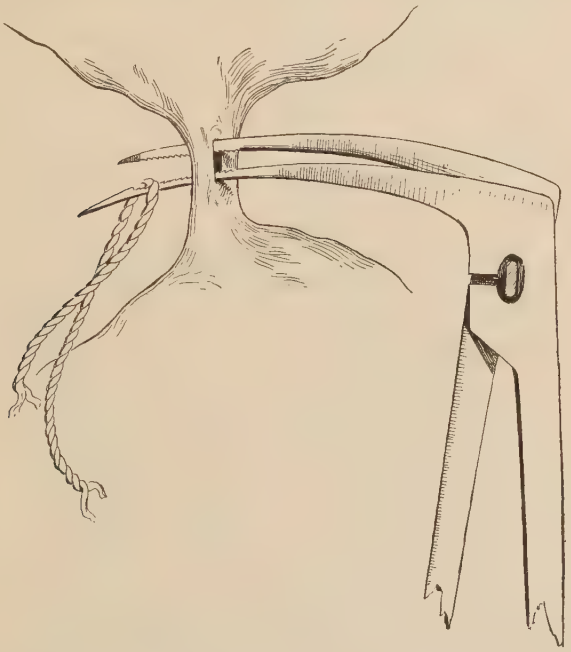


FIG. 84. Showing application of ligature carrier.

held by the assistant, thus making a double loop, as shown in Fig. 86. As a precaution the two ends on one side are made to completely encircle the pedicle, and they are tied beneath the other loops. This makes a double ligature which, if tied properly, can absolutely be relied upon to control bleeding from the stump.

These ligatures should not be pulled upon after the pedicle has been divided, as they may slip off or become loose, but the ends are not cut short usually until the pedicle has been divided. The pedicle seized on either side above

the ligature (to the outer side) between it and the tumor, and the pedicle is divided close to the clamps (between them and the tumor) with stout long-handled scissors, and the tumor is lifted away, leaving the stump supported by the clamps. The application of the clamps to the pedicle puts the stump under the control of the operator, avoiding traction on the ligatures, and it is thus prevented from slipping back into the pelvis out of sight when the tumor is removed.

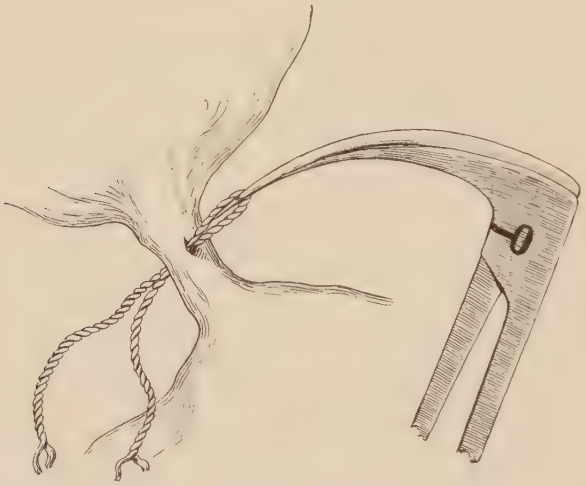


Fig 85. Showing ligature drawn through the pedicle by the ligature carrier.

The stump is now inspected, and in some instances the exposed end is seared with a cautery at dull heat to prevent adhesion with the intestines. The clamps are now removed, the ligature ends are cut short, and the pedicle is permitted to retract into the pelvis. The appendages on the opposite side are now examined, being drawn up into view for inspection if necessary.

If the patient has been properly prepared the intestines will be empty and collapsed and will give the assistant no trouble throughout the operation, but if they are distended

they will protrude unavoidably through the abdominal incision, cause no end of trouble, and retard the operator greatly.

Under favorable conditions, where firm adhesions with the intestines are not encountered, this operation should not

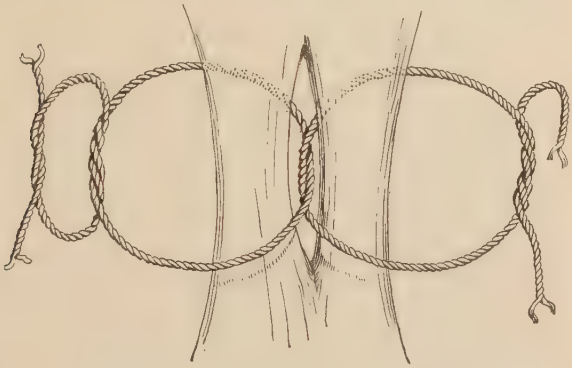


FIG. 86. Showing method of ligating pedicle with double ligature.

consume more than fifteen minutes from the time the first incision is made until the abdominal wound is completely closed. Much will depend, however, upon the efficiency of the assistants, and no abdominal operation should be undertaken with untrained assistants. There is great gain to the patient by limiting the time the peritoneal cavity is exposed, and this point should be especially considered in operating upon women of advanced years.

For the technique of closing the abdominal incision and the after care of the wound, the reader is referred to the chapter upon this subject.

CHAPTER XVII.

OÖPHORECTOMY.

When it becomes necessary to remove one or both ovaries it is by no means necessary to remove also the accompanying tube, if it is in good condition. Such a procedure offers no material advantage, while it adds to the risk of the operation, and, by destroying the integrity of the broad ligament, deprives the uterus of its support. Whenever possible a portion of the ovary should also be preserved, particularly when both ovaries are involved, but it is important even when only one is to be removed in a primary operation, since it may become necessary subsequently to remove the other completely, and the woman would thus be deprived of both. This and similar conservative operations upon the ovary will be taken up under a separate head.

Preparation of the Patient.—The preparation for the operation is fully described under the head of "Preparation of the Patient for Abdominal Operations," where will be found described in detail the means necessary to establish a normal activity of the excretory organs, thereby obviating intestinal distention, minimizing the shock, and securing a smooth convalescence.

The immediate preparation of the field of operation will comprise shaving the abdomen and pubes, and rendering the surface aseptic by scrubbing with green soap and nail-brush, and washing it afterwards, first with a warm one per cent. solution of lysol, then with alcohol and ether. This should be done several hours prior to the time set for the operation, preferably the evening before; then the abdomen is dusted freely with dry markasol and covered with a pad of plain sterile gauze which is held in place by a binder that encircles the body. A similar dressing is applied to the vulva, which is also shaved and scrubbed, after cleansing the

vagina by copious irrigation with the lysol solution. This dressing is not disturbed until the patient is placed on the table for operation, except the vulva pad, which should be removed every time urine is voided. For the vulva a pad of markasol gauze is preferable to the other dressing.

FIG. 87. Showing method of grasping and bringing up the ovary with two fingers astride the broad ligament. Front view.

When the patient is placed on the table it is customary to scrub the surface again with soap and nail-brush, but this is unnecessary if the first scrubbing has been thorough and the above described dressing is used. It will be sufficient to wash the the surface with a stream of warm sterile water to remove the powder, and then sponge it off with ether and a wad of absorbent cotton or gauze.

The patient is first placed on the table in the horizontal position on the back. When the abdominal incision has been made and the peritoneal cavity opened, a change to the Trendelenburg position, with the hips elevated and shoulders lowered so as to plaec the body at an angle of 45 degrees, will cause the intestines to gravitate towards the upper part of the abdominal cavity and facilitate access to the pelvis. This position is not always necessary, however, for simple operations within the pelvis, such as the one under consideration here.

The ovaries may be removed through a small median ab-

dominal incision just sufficient in length to permit the easy introduction of two fingers. (See chapter on Making and Closing the Cœliotomy Incision.)

This incision is made low down, beginning about midway between the umbilicus and pubes, and terminating just above the symphysis pubis. The bladder should be emptied by catheter beforehand, and in dividing the peritoneum at the lower angle of the incision care should be taken not to wound the bladder or encroach too closely upon its fundus.

Technique of the Operation.—When the peritoneal incision has been enlarged to the extent of the incision in the abdominal wall, the index and middle fingers of the left hand (the surgeon standing to the right of the patient on the table) are inserted, their palmar surface directed downward towards the pubes, and, passing along the inner surface of the abdominal wall until the symphysis pubis is reached, they are directed backward and downward over the bladder until the fundus of the uterus is reached. The fingers are now separated, and one is directed

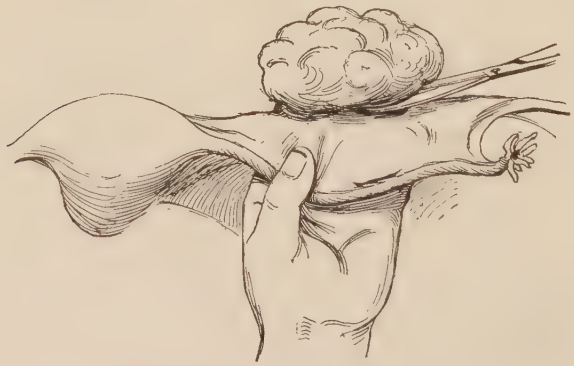


Fig. 88. Showing method of grasping the broad ligament and excision of the ovary without destroying the integrity of the ligament.

behind the uterus and the other in front, and they are slipped off to one side towards the cornu uteri and broad ligament, behind which the ovary is found. If the ovary is prolapsed it will be found low down, back of the broad ligament,

sometimes in Douglas's pouch. To bring the ovary up into view the two fingers astride the broad ligament, with their palmar surfaces towards the uterus, are passed along the ligament to its outer extremity near the pelvic wall, then down under the ovary. (See Fig. 88.)

If the ovary is not readily found, or is not easily drawn up, a dull-pointed angular tenaculum forceps or bullet forceps may be fastened in the fundus of the uterus, being passed down into position between two fingers as a guide,

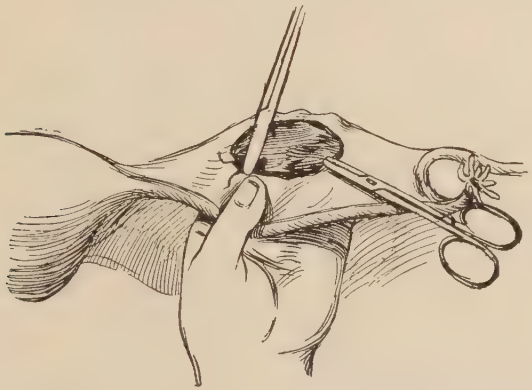


FIG. 89. Showing the wound area on posterior surface of the broad ligament left after removal of the ovary, and bleeding points clamped with hemostatic forceps, preparatory for ligation.

their palmar surfaces resting on the posterior surface of the uterus, and it is drawn up out of the pelvis. The forceps are grasped with the right hand (never given to an assistant to hold, because he cannot regulate the traction upon them, and they may tear out), and the two fingers are passed down astride the broad ligament and under the ovary, as described above. There should now be no difficulty in locating the ovary and bringing it up into view, if it is not bound by adhesions.

When adhesions are encountered they should be broken up by passing the finger under the ovary and working from below upward, following the outline of the ovary. Care must be observed in doing this, as it would be very easy to

rupture a thin walled cyst or pus sac. Before attempting to free an adherent ovary, it and the tube should be carefully examined by palpation to locate any fluctuating points or exclude them. Firm adhesions which do not yield to the finger may be divided with scissors, after being brought up into view. Adhesions to the extremity of the tube or along its course may be divided either by dissection with the finger or with blunt, curved scissors, after the ovary and tube have been brought up into view.

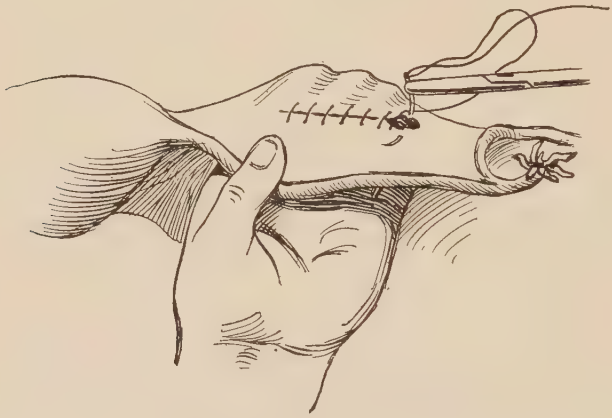


Fig. 90. Showing method of closing by continuous suture the wound on posterior face of broad ligament left after removal of the ovary.

If, after careful inspection, it is decided that complete removal is necessary, the operation is proceeded with. The broad ligament is grasped between the two fingers in front of it and the thumb behind just above the attachment of the ovary. The two fingers in front are passed down along the anterior face of the broad ligament, until opposite or below the point of attachment of the ovary, and pressing them backward, the broad ligament is bulged out posteriorly, the ovary projecting like a teat from its surface, its attachment thereto being outlined perfectly. (See Fig. 88.)

By compressing the broad ligament between the thumb and fingers thus placed, the blood supply to the ovary is

completely under control of the operator. The ovary may now be snipped off from its attachment to the broad ligament with stout curved scissors, without perforating the ligament. (See Fig. 88.) There will be no active bleeding from the severed vessels until the pressure is relaxed; then as the bleeding points are located they are picked up with hemostatic forceps and ligated with fine catgut. (See Fig. 89.)

The surface from which the ovary has been removed is now covered over, to prevent adhesion with knuckles of intestines, by bringing the margins together by means of a continuous suture of fine catgut, as represented in Fig. 90. This removal of the ovary is accomplished without making a pedicle, the integrity of the broad ligament is preserved, and no raw surface is left to form adhesions. The avoidance of a mass ligature is also a great advantage.

Since the peritoneum has not been soiled and no blood has escaped, sponging or flushing is unnecessary, and it only remains to close the abdominal incision in the usual manner as described under the proper heading. The deep through-and-through sutures are never required in these short incisions, and by omitting them the disfiguring scar is avoided. The continuous layer suture and the subcuticular suture for approximating the integument are particularly appropriate in these cases, the resulting scar being scarcely noticeable.

The subsequent management of these cases is simple and will be found detailed under the head of "After-treatment of Abdominal Section."

CHAPTER XVIII.

CONSERVATIVE OÖPHORECTOMY.

An enumeration of the conditions where conservative surgery of the ovary may be done to advantage is beyond the scope of this work, but it is an established rule with progressive gynecological surgeons to save an ovary, or a portion of an ovary, whenever it is possible without detriment to the future well-being of the patient. Conservatism may consist in freeing an ovary from adhesions that interfere with its circulation and nutrition; or, if it is prolapsed, bringing it up and attaching it to the side of the uterus; or exsection of a portion of an ovary; or the excision of small cysts involving only a portion of the ovary, the remainder, if sound, being left behind.

The abdomen being opened by a short incision, as described under the preceding head, two fingers are inserted through the incision and carried down into the pelvis, locating the fundus of the uterus. One finger is then passed down behind the broad ligament and the other in front, and astride the ligament thus they are passed along to the lateral wall of the pelvis beyond the extremity of the tube, and down under the ovary, as shown in Fig. 87.

The adhesions binding the ovary and tube are separated from below upward by the finger when possible; but firm bands that do not yield may be divided with scissors or the knife, preferably after bringing them up into view. Sometimes the ovary cannot be brought up until these bands are divided. The hips are then raised into the Trendelenburg position, and the intestines are pushed up and held back by broad, flat gauze pads, so as to expose the bottom of the pelvic peritoneal cavity, and these bands of adhesions are divided with long-handled blunt curved scissors. The

operator should be certain of the structures thus divided deep down in the pelvis, and no time should be lost afterwards in bringing the tube and ovary up into the abdominal incision, and promptly securing any vessel that may have been severed. Usually the bleeding is insignificant.

FIG. 91. Showing method of excising a portion of the ovary in its long axis.

Adhesions constricting the tube and producing abnormal convolutions should also be divided, and its normal relation to the ovary and broad ligament should be restored. Of this, however, more will be said under another head.

If after freeing the adhesions and bringing the ovary and tube up into a normal position in the pelvis it is decided that they are not beyond recuperation, and that their condition was caused by the constriction and consequent defective nutrition which has been overcome, nothing more is done.

When an enlarged ovary is prolapsed, after freeing the adhesions binding it down, thus separating the adhesions found between it and the tube, particularly at the fimbriated extremity, it is attached by a fine silk suture to the side of the uterus near the cornu. A fine half-curved needle in the

grasp of a needle forceps is employed, the suture being threaded directly into the needle. The needle is first inserted into the uterus near the cornu, and the suture is drawn through, penetrating about an eighth of an inch deep, and taking in a breadth of a quarter of an inch. Then it is inserted through the inner pole of the ovary, taking in about the same amount of tissue, and the suture is drawn through this also. The needle is again inserted upon the uterine surface, either above or below the first insertion, and again through the ovary, and the suture is drawn through, thus making a double loop and two continuous

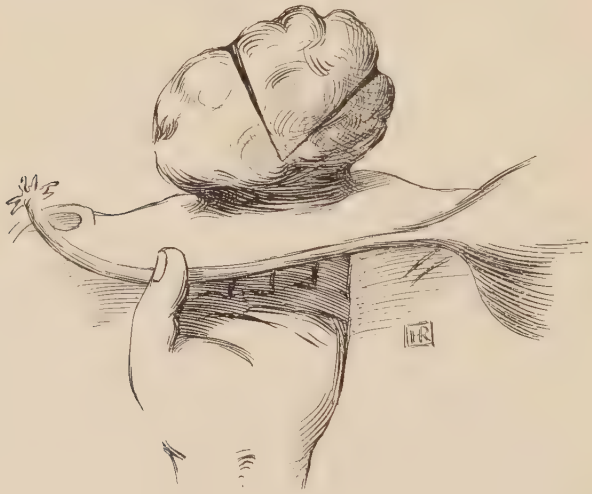


Fig. 92. Showing exsection of a cross section of the ovary.

sutures, which secure the ovary firmly to the side of the uterus, and approximate a broader area of surface for adhesion than if only one suture had been employed. The free ends of the ligature are tied firmly, but not tight enough to cut the ovarian tissue. This brings the ovary close to the side of the uterus. The ends of the suture are cut short, and the abdomen is closed without irrigation and without drainage.

If the ovary is found embedded in a mass of soft exudation, it is shelled out and brought up in the same manner as described above. It is a wiser and better plan, however, to cause absorption of the exudation before opening the abdomen by employing for a time stimulating applications of faradization through the vagina, and painting the vaginal vault with iodine.

FIG. 93. Showing method of approximating by continuous suture the remaining ovarian structure after removal of the diseased portion.

When a portion of the ovarian structure is found to be so far degenerated as to require removal, and if even a smaller portion appears sound, the diseased portion is excised by a wedge-shaped incision as shown in Figs. 91 and 92. Three fingers are passed down in front of the broad ligament, and the ovary is raised up and made to project, as shown in the figures. Flat gauze pads are now placed under and around the broad ligament to protect the peritoneal cavity beneath, and the edges of the abdominal incision, as pus is sometimes encountered in the structure of diseased ovaries.

The incision may be either in the long axis of the ovary

(Fig. 91), or across the centre (Fig. 92), or may include one pole, care being taken to extend the incision on both sides well beyond the diseased portion, so as to leave behind nothing but sound tissue.

The bleeding from the ovarian tissue is usually insignificant, and is readily controlled by the suture used for approximation. If the oozing is free it is controlled by compression of the broad ligament with the fingers, holding it until the sutures are inserted and tightened.

The margins of the remaining ovarian structure are approximated by a continuous suture of fine catgut inserted by means of a fine half-curved needle, as shown in Fig. 93, well down into the tissue. Each loop is drawn tight enough to control the oozing and approximate the margins evenly.

Small cysts, involving only a portion of the ovary, may be shelled out before rupture or dissected out after, and the edges of the remaining ovarian structure brought together by suture, as described above.

In these cases the stump of the ovary, after all oozing has been controlled and the gauze pads have been removed, is dropped back into the pelvis, and the abdomen is closed without irrigation or subsequent drainage, as the peritoneum has not been soiled.

The after-management of these cases is simple, complications during convalescence being extremely rare if the patient has undergone thorough preparation for the operation. Usually she may be permitted to sit up at the end of two weeks if the abdominal wound has healed firmly.

CHAPTER XIX.

SALPINGECTOMY.

When it becomes necessary to remove the tube, the ovary not being sufficiently diseased to require removal also, the tube alone may be dissected out and the ovary left behind. Such a condition may not very often exist, but preservation of the ovary under such circumstances is consistent with conservatism, and is always to be encouraged.

Thus in some cases of hydrosalpinx, and even in suppurative salpingitis and recent pyosalpinx, the ovary may be preserved, the tube being dissected out and the broad ligament left intact.

If the course of the ovarian artery is recalled it will be seen that the tube may be removed without dividing the artery. The branches from it that supply the tube are caught up and ligated separately after the tube has been removed.

The preparations for the operation are the same as already described under oophorectomy.

The abdomen is opened by a median incision of medium length, between the umbilicus and pubes. The patient is placed in the Trendelenburg position when it is found to be necessary to get the intestines away from the field of operation. A broad, flat gauze pad, with tape attached, is introduced well down in the pelvis behind the uterus and spread out over the intestines to get them out of the way and protect them from injury. It is customary to assign the duty of keeping back the intestines to the first assistant, and whenever necessary he introduces one or two fingers through the abdominal incision and uses them as retractors for this purpose. Usually this is not necessary when the Trendelenburg position is employed.

The operator inserts two fingers of the left hand into

the pelvis, and sweeping them around in front and behind the uterus it is freed from adhesions. Then passing them down astride the broad ligament on each side, one in front and the other behind, with their palmar surfaces directed toward the uterus, they are passed along beyond the extremity of the tube and down under the ovary, breaking up the adhesions encountered from below upward. When the ovary and tube have been freed they are drawn up into the incision into view, and flat gauze pads are

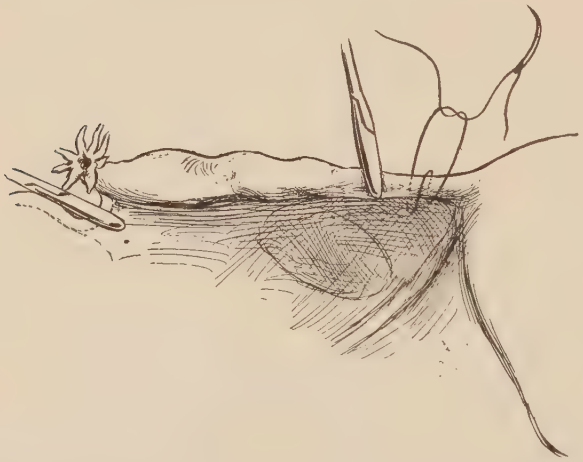


Fig. 94. Showing tube grasped by pressure forceps, and the application of the ligature with double loop to obviate slipping when the tube is divided.

packed under and around them to protect the surrounding peritoneum. The broad ligament is then put upon the stretch by passing two or three fingers in front and the thumb behind or on top of it. (See Technique of Oöphorectomy and accompanying illustrations.) The ovarian artery is thus placed under the control of the operator. The tube is put still more on the stretch by grasping it with a pressure clamp a short distance from the horn of the uterus (see Fig. 94). This clamp should include the tube structure only, and should not be passed far enough down from

the top of the broad ligament to compress the ovarian artery.

Any adhesions of the tube to the ovary throughout its course or at its extremity are now carefully divided with scissors, and another clamp may be applied to its other extremity and given to an assistant to hold (see Fig. 95).

FIG. 95. Showing the manner of dissecting the tube off from the broad ligament, both ends being clamped to prevent leakage.

A medium size silk ligature threaded in a curved needle, in the grasp of a needle forceps, is passed through the broad ligament close under the tube between the inner clamp and the side of the uterus (see Fig. 94); then it is carried over the top of the tube encircling it, and is passed again through the broad ligament in the same direction, a little farther away from the tube but above the ovarian artery, so as not to include it. Thus the ligature is passed twice around the tube, which prevents slipping. This ligature is then drawn tight and tied (see Fig. 94). Traction is made upon the clamp attached to the tube at this point, and the tube is divided with curved scissors outside of the applied ligature, between it and the clamp (see Fig. 95). The tube is dissected off from the broad ligament with scissors, as shown in Fig. 95, taking care to keep close to the tube. The small branches of the ovarian artery supply-

ing the tube that have been severed are caught up and ligated with fine catgut.

A continuous over-and-over suture of catgut is then applied to the top of the broad ligament, beginning at the stump of the ligated tube and terminating at the infundibulo-pelvic ligament. (See Fig. 96.)

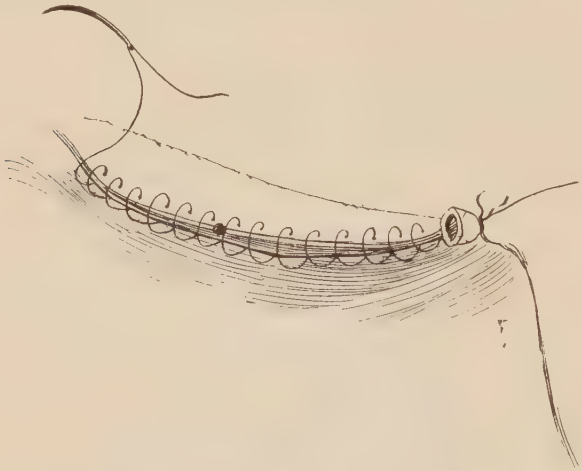


Fig. 96. Showing method of closing the top of the broad ligament with continuous suture.

When it is possible to preserve a portion of the inner part of the tube it is not ligated, but left open as described under the head of conservative salpingectomy.

If the peritoneum has been perfectly protected with gauze pads it will not have been soiled, but if the contents of a cystic tube have escaped during its removal, and have soiled the peritoneum, it should be thoroughly flushed repeatedly with warm normal salt solution to remove, as far as possible, all source of infection. It is a good plan also at times to leave the abdomen fairly well filled with the normal salt solution, which is rapidly absorbed after the abdomen is closed.

It is customary in these cases now to close the abdomen without a drain, and if drainage becomes necessary later

to open the pouch of Douglas through the vagina. Where the necessity for drainage is evident at the time of completing the operation the opening through the bottom of Douglas's pouch into the vagina is made from above downward. An assistant is directed to insert two fingers into the vagina, well up posteriorly to the cervix, which serve as a guide, and the operator makes an opening between them with a pair of long-handled straight scissors from within the pelvic cavity at the bottom of Douglas's pouch. A piece of sterile gauze is then passed down through into the vagina with a pair of long-handled dressing forceps, or a broad ligament clamp, and is caught by the assistant and the end pulled down into the vagina. The upper end is spread out over the floor of the peritoneum posterior to the uterus. This gauze drain is pulled out through the vagina two or three days later when there is no longer any necessity for drainage.

The abdominal wound is closed in the usual manner, as has been described before.

CHAPTER XX.

CONSERVATIVE SALPINGECTOMY.

Conservative surgery upon the tubes comprises more than the excision of a portion of the tube, and nowhere may it be considered more properly than under this head.

Tubes that have been rendered functionally useless by being bent upon themselves, twisted or constricted by adhesions, may only require to be freed and straightened out. Adhesions of the fimbriated extremity to the ovary require to be separated, and if the opening of the tube is occluded at this point, it should be rendered patent. Inflamed tubes may require to be emptied, cleansed and sterilized, and finally, if the outer portion of the tube is sufficiently diseased to require removal, it is excised and the inner portion preserved.

Adherent tubes are freed by breaking up adhesions with the finger or fingers, from below upwards, where possible, and whenever the adhesions are too dense to yield to such manipulation, they are brought up into view, surrounded by flat gauze pads, and the adhesions are divided with the scissors or the knife. In this manner all adhesions found to constrict the tube and distort it are separated to permit it to be straightened out. All adhesions of the tube to the broad ligament or the ovary, and to itself, are to be freed, and under no condition is it to be left kinked in any portion. The abdominal end of the tube, when found to be occluded, is to be opened by slitting it from without to a distance of one-quarter to one-third of an inch.

Afterwards the mucous lining is to be attached to its peritoneal covering by means of fine catgut sutures. (See Fig. 97.) The character of the contents of the diseased tube must be ascertained by milking it between the fingers toward the opening. When upon examination there is

found to be an admixture of pus, the tube must first be washed out with normal salt solution, which is then squeezed out, and afterwards it is sterilized by injecting into it a solution of bichloride of mercury, 1 to 5000. Care must be taken during this manipulation to protect the peritoneal cavity perfectly, both from the escape of the contents of the tube and from the subsequent washings therefrom. In order to accomplish this effectually it will be necessary to place under the tube, in addition to the gauze pad, a broad sheet of thin rubber, which is to be fastened securely under the gauze pad so as to prevent any leakage into the peritoneal cavity.

FIG. 97. Showing excision of outer portion of the tube, with sutures applied attaching the mucous lining of the stump to its peritoneal covering.

A moderately distended tube, where the structure of its wall is not beyond redemption, may be incised, the contents evacuated, the tube washed out and sterilized in the manner described above, and, after making sure that both tube ends are pervious by passing a sound or probe through the abdominal ostium, and also through the uterine end into the uterus, the incision is brought together by a continuous suture of fine catgut. This applies to hydrosalpinx, pyosalpinx, or tubal pregnancy where the tube is free or bound only by moderate adhesions that are readily separated.

If the outer portion of the tube only is diseased, it may be excised, and the inner healthy portion for an inch or an inch and a half is left behind. Whenever a portion of a tube can be saved it is important, if the ovary has been preserved, even if it is the tube of the opposite side, for cases have been recorded where pregnancy has supervened under such condition. It is, of course, important to preserve the patency of the tube end remaining. To insure this, it is split up and its mucous lining is stitched to its peritoneal covering by means of fine catgut. (See Fig. 97.) The stump of the tube is then attached to the ovary by means of one ligature of fine silk. When a portion of the tube is excised, the remaining stump is not ligated, but the tube is simply clamped and excised beyond the clamp, as described under the preceding head. Care must be observed not to apply the clamp tight enough to destroy the integrity of the tube. When the secretions from the remaining stump are found to contain pus, it should be washed out and sterilized, as before described, using for this purpose a syringe with a small bulbous point that will fit the calibre of the tube snugly, so as to distend the tube with the fluid.

After removal of the outside portion, the bleeding points at the top of the broad ligament are picked up and ligated with fine catgut. The clamp is now removed, and the divided end of the tube is split up for one-quarter of an inch to enlarge the opening. The mucous lining of the tube is then attached to its peritoneal covering by sutures of fine catgut. To insure the patency of the uterine end of the tube, a fine probe is passed down through the tube into the uterus. The lower border of the divided tube end is then attached to the border of the ovary with a fine silk ligature.

After the operation has been completed, the field is carefully washed off with warm normal salt solution to remove clots and other possible sources of infection. The stump is then wiped dry, and if no bleeding points are detected, the gauze pads are removed, and it is returned into the peritoneal cavity.

If careful asepsis has been observed, there will be no

necessity for drainage in these cases, and it will then be necessary only to close the abdominal wound, which is done in the usual manner.

The after-care in these cases is practically the same as in all other abdominal operations. Attention must be given to the bowels to keep them active during the first few days, so as to obviate formation of adhesions to the stump or the raw surfaces left from separated adhesions. The period of confinement to bed in these cases is usually from two to three weeks.

Salpingo-Oöphorectomy.

When both ovary and tube are so much involved as to preclude the advisability of attempting to save any portion of either structure, they are both removed, and with them, necessarily, a portion of the broad ligament. The integrity of this ligament is thus destroyed. If, therefore, the adnexa of both sides are removed and the uterus is left behind (a course the author strongly advocates for obvious reasons when the uterus is in good condition), being thus deprived of the support afforded by the broad ligament, it is advisable to bring the uterus up and suspend it from the anterior abdominal wall at the lower angle of the wound. (See "Technique of Ventral Suspension.")

The adhesions binding the diseased mass constituting the tube and ovary are separated, as has already been described under the preceding heads, by passing two fingers, one behind and the other in front of the broad ligament, with their palmar surfaces directed towards the uterus, down under the mass, and separating the adhesions from below upwards. This done, and the tube and ovary being comparatively free, the middle and index fingers are passed down behind the broad ligament, and with the thumb in front, it is grasped between them. A quarter-curved needle, threaded with strong, medium-size silk ligature, in the grasp of a needle forceps, is inserted upon the anterior face of the broad ligament, a short distance from the uterus, passing down under the ovarian artery and emerging on

the same face (anterior) of the broad ligament below the tube. (See Fig. 98.)

The ligature being drawn through, the needle is again inserted through the broad ligament just below the first insertion, and is brought out on the posterior face. The ligature is drawn through and is then tied with the free end over the top of the tube. (See Fig. 99.) Thus two loops

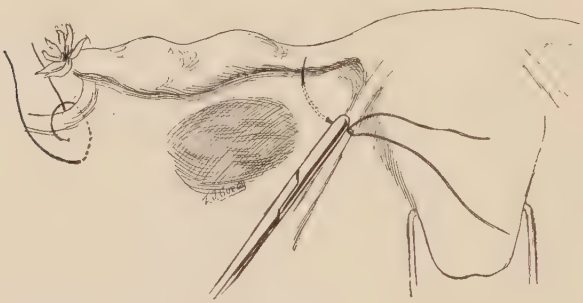


Fig. 98. Showing the first insertion of the needle under the ovarian artery near the side of the uterus; also the application of the ligature with double loop to the infundibulo-pelvic ligament, including the artery at that point beyond the extremity of the tube.

have been made with the same ligature, one encircling the ovarian artery and the other encircling both artery and tube. The advantage of the ligature applied in this manner is that it will not slip when the tube is divided and removed; therefore, the ovarian artery is thoroughly secured, and there is no danger of subsequent hemorrhage from that source.

The next step is to ligate the ovarian artery at the outer portion of the broad ligament, beyond the extremity of the tube. One or two fingers are passed down behind the broad ligament, and by pressure forwards, the clear space below the artery is exposed. The needle carrying the ligature (same material—silk) is made to transfix the clear space, and the ligature is brought out on the posterior face of the broad ligament. The loop is then carried over the top of the infundibulo-pelvic ligament, and the needle is

made to transfix the broad ligament again, just beneath the infundibulo-pelvic ligament. Thus two loops are made with the same ligature, as before, to avoid slipping. When this ligature is tied, the knot is made to come on the anterior face of the broad ligament, rather than directly on the top of it.

Next the ovary and tube are excised with a pair of blunt-curved scissors, beginning at the side of the uterus, but

FIG. 90. Showing ligature beyond the extremity of tube tied, and also the application of the ligature with double loop at the uterine end of the tube.

outside of the applied ligature. The roof of the broad ligament, with the tube, is caught with a pressure clamp and drawn up, the scissors dividing the tube and broad ligament under the ovary, out to the extremity of the tube, but to the inner side of the ligature applied there. This application of the clamp to the tube prevents escape of its contents.

It is well to secure the uterus with an angular tenaculum forceps or bullet forceps, to prevent retraction into the pelvis when the broad ligament is divided, which retains the field and stumps of the ligated vessel within view and within ready access in case they bleed, which, however, could only occur if the ligatures had been ineffectually tied. If they have been tied properly, there should be no active bleeding, but there will always be some oozing from the

severed broad ligament. When the bleeding is sufficient to demand it, these points are caught up with artery clamps and ligated with fine catgut.

A continuous over-and-over suture of fine catgut is finally applied to the divided edge of the broad ligament, beginning at the ligated stump near the uterus, and terminating at the outer stump near the side of the pelvis. This suture, which is whipped over the raw edge of the broad ligament (in the manner shown in Fig. 96), is drawn tight so as to pucker in the ligament instead of leaving it loose.

The application of the ligatures in this manner obviates slipping and minimizes the danger of secondary hemorrhage. The use of silk for these ligatures, which is more reliable than catgut, practically precludes the possibility of hemorrhage. The application of the over-and-over suture to the broad ligament and puckering it by drawing it tight, insures support to the uterus by building up the structure between it and the pelvic wall.

When pus has not been permitted to escape and soil the field of operation, silk ligatures may be employed with impunity in this locality and are more reliable, but if the field has been submitted to infection, catgut ligatures are to be preferred, as they do not carry infection so readily as silk.

CHAPTER XXI.

DIVISION OF THE UTERINE ARTERIES.

Certain fibroids of medium size growing in and from the uterine walls below the fundus receive their principal blood supply from the uterine arteries; consequently complete obliteration of these vessels deprives them suddenly of sufficient nourishment for their maintenance and growth, and atrophy is the result. In time the ovarian arteries, their other source of nutrition, may enlarge and compensate for this loss, but before this can take place the tumor, which is of a low order of vitality, has usually undergone complete atrophy. The uterus and adjacent healthy structures do not suffer from the diminished nutrition as do adventitious growths, hence their function is not seriously impaired. There is almost always after the operation a marked decrease in the menstrual flow, which in some of these cases is greatly increased, but eventually there is a restoration to the normal standard.

The operation has not met with the favor it deserves, because as usually done the vessels are only temporarily compressed by the ligature, which soon loosens and permits the circulation to be re-established. It is essential that the continuity of the artery should be permanently destroyed, and the only way this can be made certain is to divide it. Simple ligation necessarily includes other tissue with the vessel which can not be satisfactorily isolated; therefore, when this tissue shrinks as the result of compression, the ligature loosens and the circulation through the vessel is restored.

The limitation of this operation to such tumors as may be influenced by cutting off the supply of the uterine arteries is important, and upon this, as well, depends the success which may follow. It would be unreasonable to expect very large tumors which fill or nearly fill the ab-

dominal cavity to be influenced materially by this procedure, since the other sources of blood supply are greatly increased as the tumor develops out of the peritoneal cavity. The uterine arteries are not the chief source of nutrition in those cases, as they are when the tumors are smaller. The other sources of nutrition, the ovarian arteries, are not only greatly increased in size, but these tumors are frequently fed by new vessels established through adhesions with adjacent organs and structures. When, however, the tumor is small or has not developed above the level of the umbilicus, the uterine arteries furnish the chief blood supply. But when a tumor springs from the fundus or near it, it gets its blood supply chiefly from the ovarian arteries, and cutting the uterine arteries cannot be expected to influence the growth materially.

Preparation for the Operation.—The patient should be as carefully prepared as for any other vaginal section, and in the preparation of the vulva and vagina the same care must be observed to secure absolute asepsis, as was described under the head af vaginal ovariotomy. The patient is anaesthetized and placed upon the table in the exaggerated lithotomy position, with the buttocks well over the edge of the table and resting on a rubber pad with apron attached.

Before proceeding with the operation the canal of the uterus is dilated gradually with the steel dilator (as described under the head of curettage for uterine fibroids), the cavity is carefully curetted with the dull or semi-sharp curette, and the internal os and cervical canal with the sharp instrument. After free irrigation, using if necessary a strong solution of iodine to control bleeding, the cavity and canal are packed with either plain sterile or iodoform gauze, and a traction ligature is introduced through both lips of the cervix and tied so as to close the external os.

Instruments Required.—A short, broad-bladed, hard rubber perineal retractor.

A pair of long handled blunt scissors curved on the flat.

A tenaculum with long handle.

A special curved ligature carrier with long handle and semi-sharp.

Four broad ligament clamps of different sizes, curved and straight.

One-half dozen hemostatic clamp-forceps.

One-half dozen sponge-holders.

One-half dozen quarter-curved needles, three-quarters and an inch long.

In addition there will be required some strong pedicle silk, No. 2 and No. 3 catgut, a rubber drainage pad and leg holder.

Besides the anaesthetizer there should be two assistants and two nurses. They are stationed as described for vaginal ovariotomy.

Technique of the Operation.—The perineal retractor is retained in the vagina, being held by the nurse in her right hand as she sits to the left of the operator. The cervix is drawn down and well over to the right by means of the traction ligature inserted in the cervix, which is then given to the nurse to hold with her left hand. Fixing the tenaculum in the vaginal wall at the cervico-vaginal fold to the left of the cervix, so as to steady it, a semi-circular incision is made with curved scissors, following this fold around on the left of the cervix, as shown in Fig. 100. This incision is extended nearly half way around the cervix anteriorly and posteriorly, and penetrates the vaginal wall into the cellular tissue beneath. The scissors are now laid aside, and the dissection continued with the fingers, exposing the base of the broad ligament, but hugging the side of the uterus. The two index fingers are now inserted at the anterior angle of the incision, and the bladder and peritoneum are separated from the base of the broad ligament tissue. At the same time the ureters are crowded farther away from the side of the uterus. Next, the fingers are inserted at the posterior angle of the incision and the rectum and peritoneum there are pushed backward and separated for some distance upward, so that the finger may be passed up behind the uterine artery. It is well not to

penetrate the peritoneum, and it is quite unnecessary to do so, though it does not materially increase the risk.

There may be considerable bleeding from small vessels torn during this dissection, but it may be disregarded, as it would consume too much time to attempt to control it, and it will cease when the ligature is applied to the main vessel.

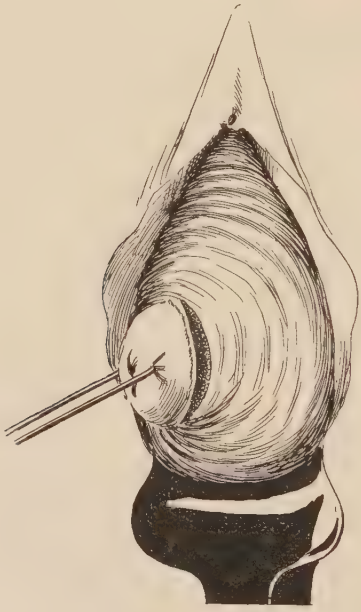


Fig. 100 Showing uterus drawn down and well over to the right, and the incision through the vaginal wall on the left of the cervix at the cervico-vaginal fold.

The cervix is now drawn over further to the right, putting the broad ligament more upon the stretch, and increasing the available space between it and the ureter. Inserting the left index finger well up posteriorly and the right anteriorly to the base of the broad ligament, and bringing their palmar surfaces together, the pulsation of the uterine artery of that side may be felt between them.

Having located the vessel in this manner, the left finger is retained in position while the right is withdrawn, and by means of the ligature-carrier a stout silk ligature is carried up in front of the vessel and around it along the finger as a guide, as represented in Fig. 101. If it is certain that the ligature encircles the uterine artery it is tied tightly, but the ends of the ligature are not cut off until later.

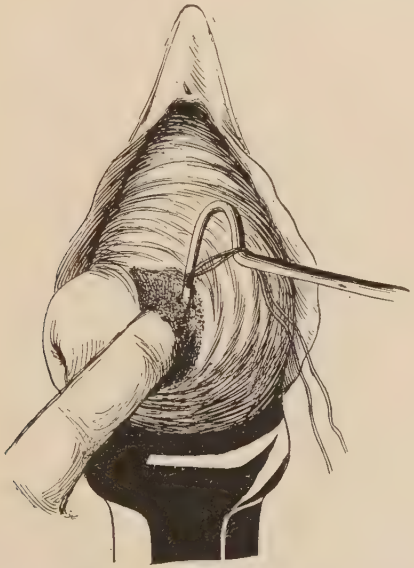


FIG. 101. Showing the method of application of the ligature to the uterine artery on the left side.

Care must be taken not to include the ureter, which crosses the uterine artery only half an inch from the side of the uterus. The safest way to avoid this is to take care during the dissection to push the ureter well away from the uterus, and in applying the ligature to keep within half an inch of the uterus.

The ligature will include with the vessel the tissue of the base of the broad ligament, and in order that it may compress the artery sufficiently to control bleeding when

it is severed, it is well to isolate the vessel as much as possible before applying it. Before severing the vessel the traction ligature in the cervix and the ligature around the artery are tightened slightly, so as to put upon the stretch the intervening tissue between the ligature and the uterus. Have in readiness the broad ligament clamps in case the ligature should slip after the vessel is divided, and the

Fig. 102. Showing distal end of uterine artery ligated, the vessel divided, and pressure forceps attached to the uterine end which is tied also.

hemostatic forceps for picking up the free end of the artery. Slipping of the ligature is an accident which may happen to the best operator, though it should not occur, and it is well always to be prepared to meet it.

The artery is divided with the scissors about midway between the ligature and the side of the uterus, and the free uterine end which bleeds freely because of anastomosis with the ovarian artery is picked up quickly with hemostatic forceps and tied with catgut, as represented in Fig. 102.

Should the first ligature slip, the tissue including the artery is clamped with a broad ligament clamp, and a second ligature applied to the outer side of the clamp, but close to it to avoid the ureter.

All bleeding being controlled, using extra ligatures to bleeding points if necessary, the wound is irrigated with

Fig. 103. Shows the operation completed on both sides, with ligature ends coming out into the vagina at the lower angle of the wound on each side.

normal salt solution. The ends of the catgut ligature are cut short, and one end of the silk ligature, the other being left long and brought out into the vagina at the posterior angle of the incision. This serves as a drain, and for withdrawing the knot and loop after the latter has become detached. The wound is now closed with a continuous suture of chromicized catgut.

The cervix is next drawn over to the other side (left), and the same thing is repeated on the right side, the in-

cision being subsequently closed in the same manner. Upon completion of the operation on both sides the wounds appear as represented in Fig. 103. The traction ligature in the cervix and gauze from the canal are finally removed.

The dressing consists of a loose tampon of iodoform gauze placed on either side of the cervix and filling the vagina to absorb oozing. This is left undisturbed for forty-eight hours, when it is removed, and usually it is not renewed. Subsequently vaginal douches are used only if required, if there is suppuration or discharge, which is the exception.

The patient is confined to bed for two weeks, and the ligature is removed when it becomes loose, and can be withdrawn easily without too great traction.

This operation involves no risk, except that of including a ureter in the ligature around the uterine artery, and its results in my hands have been what was anticipated.

CHAPTER XXII.

ABDOMINAL MYOMECTOMY.

The removal by enucleation of solid tumors growing in or upon the uterine wall, or attached to it by a pedicle, and also removal by the abdomen of similar tumors projecting into the uterine cavity when too large to be removed by the vagina through the cervix, is designated myomectomy.

The operation is done through an abdominal incision by preference when the tumors are numerous, large or deep seated in the uterine wall; by the vagina when the tumors are mere nodules and are easily accessible through a vaginal incision, either posterior or anterior to the cervix, according to their location, when it is termed vaginal myomectomy, described in another chapter.

Abdominal myomectomy is one of the most conservative of all gynecological procedures, though radical in its conception, since its chief aim is removal of the tumor or tumors without sacrificing the uterus or any material part thereof, which, though greatly enlarged in some instances and often functionally useless at the time, subsequently atrophies and may become a useful functionating organ. Until very recently the operation was limited to removal of pedunculated tumors; now, however, thanks to a more perfected technique and a clearer appreciation of the requirements of aseptic surgery, it is perfectly feasible to remove tumors deep seated in the uterine wall, when so situated as to be readily accessible, and not only one but all that may be reached in a single uterus if sufficient tissue remains for covering the wounds made without undue strain upon the sutures.

Myomectomy should always be the operation of election in young women who have not passed the menopause, if the appendages are not incurably diseased, and no other contra-indications exist. A debilitated or anæmic condi-

tion of the system would prohibit a protracted operation, such as myomectomy, if the tumors are large or numerous, where operative interference is urgently demanded, unless sufficient time can be allowed for improving the general condition. When the appendages are hopelessly diseased and are to be removed there is nothing gained by a myomectomy, and it would prove too hazardous under some circumstances, especially in the presence of pus accumulations.

Fibroid tumors of the uterus are divided into four classes according to their relation to the uterine wall, viz.:

1. Pedunculated, subperitoneal growths.
2. Sessile, subperitoneal growths.
3. Interstitial or intra-mural growths.
4. Submucous or intra-uterine growths.

Pedunculated subperitoneal tumors are those which project from the outer or peritoneal surface of the uterus, to which they are attached by a more or less distinct pedicle. There may be one or several of these tumors attached to the same uterus, varying in size from a mere nodule, the size of a pea, to that of the pregnant uterus at term. With this class of tumors the uterus usually remains comparatively small, though often it is much increased in size.

Sessile tumors are also subperitoneal and project above the surface, but they are attached by a broad base and develop more or less deeply into the uterine structure proper. They also vary greatly in size, but do not attain the extremely large size of those of the former class. The uterus is apt to be larger than in cases of pedunculated tumors, though it does not attain the size it does with the next class.

Interstitial or intra-mural tumors are those which grow within the walls of the uterus. They develop outward toward the peritoneal surface or inward toward the cavity of the uterus, or in both directions. They are completely surrounded by the muscular structure of the uterus. As they grow they crowd the uterine wall before them in the direction of least resistance. This part of the uterine wall becomes attenuated, and is often so much altered as to be

unrecognizable as uterine structure, but appears as the capsule of the tumor. The uterus develops necessarily with these tumors, hence with this variety it is much lengthened out or enlarged laterally, depending upon the size of the growths, their number, and their situation. The uterine cavity is increased in length, in some cases measuring eight or ten inches or even more. Sessile and interstitial growths sometimes develop also from the lateral wall of the uterus between the folds of the broad ligament.

Submucous or intra-uterine tumors are those which develop inwards, into the cavity of the uterus. They have as a covering only the mucous membrane lining the cavity, and are sometimes attached by a broad base and sometimes by a narrow pedicle. In some instances the attachment includes the whole of one lateral surface of the cavity, and sometimes they are adherent to the whole cavity, though the adhesion is readily detached with the finger. Growing as they do within the cavity the uterus grows with them, and often attains an enormous size. It is difficult at times to differentiate this condition from a pregnant uterus, owing to the similarity of development of the uterus which is symmetrical.

The scope of abdominal myomectomy includes:

1. All pedunculated subperitoneal growths where the adnexa are normal or in condition to regain a normal state upon removal of the tumor.

2. All sessile and interstitial growths that are accessible under the same condition of the adnexa, if the tumor has not undergone degeneration, and if its removal leaves a normal uterus or one which may become normal, provided sufficient peritoneal surface remains to cover the wounds made without undue strain on the sutures. This will include broad ligament and cornual myomata. When a tumor of this variety is larger than a six months' pregnancy the difficulty of closing the wound may prohibit myomectomy.

3. Submucous or intra-uterine growths too large to be removed by the vagina through the cervix when they have not undergone degeneration.

It is not always possible to determine positively before the abdomen has been opened that a myomectomy can be successfully accomplished; therefore, both patient and operator should be prepared for the possibility of a hysterectomy in all doubtful cases.

The chief risks incurred by myomectomy that make the operation more hazardous than hysterectomy are the increased liability to hemorrhage and sepsis and prolonged exposure of the peritoneal cavity, all of which may be overcome by careful operative technique. *Hemorrhage* at the time of operation may be avoided by placing a rubber ligature around the cervix or around the uterus below the site of the tumors to be removed. *Secondary hemorrhage* is averted by carefully ligating all severed vessels before closing the wound, loosening the rubber ligature when necessary to detect them, and by closing the wound properly by means of buried sutures of fine, reliable, chromicized catgut, so as to accurately approximate and compress the whole exposed area. It is important also to unite the peritoneal margins of the wound by carefully placed interrupted sutures of the same material, rolling the edges in to secure complete contact and prompt union. *Sepsis* is avoided by taking extra precautions to prevent its entrance at the time of operation, by not handling the exposed uterine structure, using sterile rubber gloves or rubber finger stalls to prevent contact of the fingers, and by closing the cavity perfectly from bottom to top by means of buried sutures, avoiding spaces where blood or serum may collect to decompose subsequently. *Exposure and infection of the peritoneal cavity* is avoided by placing a protecting rubber sheet (Fig. 104) around the cervix or uterus below the field of operation, having it sufficiently large to cover the whole abdomen.

Preparation of the Patient.—The gravity of the operation demands most careful and thorough preparation of the patient to fortify her against the dangers to be encountered, and render the convalescence smooth and rapid. Prolonged preparation in these cases is particularly important, and,

when possible, operation should be delayed until all the excretory organs are performing their function properly and the digestive apparatus is normally active. For the details of preparatory treatment the reader is referred to the chapter on "Preparation of the Patient for Abdominal Operations."

The instruments required are:

2 scalpels.
2 thumb forceps.
1 dozen hemostatic forceps.
½ dozen broad ligament or pedicle clamps.
2 strong volsella forceps.
1 corkscrew.
½ dozen sponge holders.
1 pair long handled straight scissors.
2 pair curved blunt scissors (long and short).
A reliable needle holder.

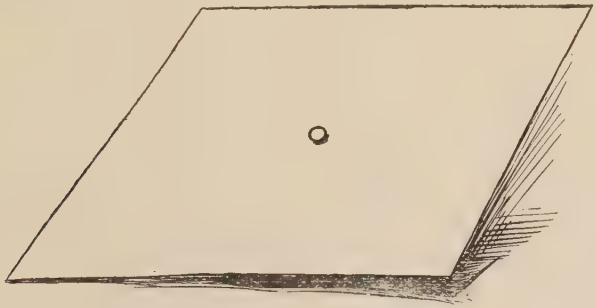


FIG. 104. Rubber protective sheet 15x18 inches, with perforation in the centre, for stretching over the fibroid uterus to protect the peritoneal cavity and intestines during myomectomy.

A pair of curved uterine dressing forceps for passing ligature around pedicle.

½ dozen quarter-curved needles, small.

½ dozen large quarter-curved needles for closing the abdominal wound.

In addition there will be required stout pedicle silk, silkworm gut, chromicized catgut No. 1. A rubber ligature and rubber sheet 15x18 inches, perforated in center. (See Fig. 104.)

A careful curettage and thorough irrigation of the uterine cavity with an antiseptic solution should be done before opening the abdomen in all myomectomies except where a submucous growth is to be removed through the abdomen, in which case it would be useless. Where interstitial tumors are to be removed the uterine cavity is also packed with sterile iodoform gauze to lessen the chance of infection, because these growths frequently encroach upon the cavity which may be entered during the process of enucleation.

Excision of Pedunculated Subperitoneal Tumors.

The abdominal incision, which is made according to directions given in the chapter on "Making and Closing the Cœliotomy Wound," must have sufficient length to permit the easy delivery of the tumor or the largest of the tumors to be removed. It is best to make a short incision first from just below the umbilicus down to within an inch and a half of the pubes, and extend it if found to be necessary. This incision penetrates the skin and muscular layer throughout the entire length down to the subperitoneal fat, which is then divided carefully, exposing the peritoneum. A point must be selected for opening the peritoneum where it is not adherent to the tumor or intestines immediately beneath. The center of the incision, in the median line, is the point usually selected, but before dividing it the peritoneum is picked up with thumb forceps and moved in different directions to see if it slides freely upon the underlying structures. If it is found to be adherent, another point is selected further up where it is free. It is especially important in these cases not to enter the peritoneal cavity below the center of the incision, because the bladder may be attached high up on the front of the tumor and may be adherent to the peritoneum of the anterior abdominal wall, and there is danger of wounding it. When the peritoneum has been entered the opening is at first enlarged only enough to admit the index finger, which is swept around, above and below, separating adhesions encountered in the

line of incision. Then it is divided with scissors along the finger as a guide to the limit of the abdominal incision above and below. The hand is now introduced before extending the abdominal incision, such adhesions as can be reached are separated, and the size of the tumor estimated. It is possible in most cases to decide at this point the character of the work to be done—whether a myomectomy or hysterectomy is to be undertaken.

If it is necessary to extend the incision beyond the umbilicus, the middle and index fingers of the left hand are inserted at the upper angle of the wound, the abdominal wall is lifted up, and, passing one blade of a pair of stout, long handled straight scissors along the groove between the fingers as a guide, the whole thickness of the abdominal wall is cut through at once. The line of incision is deflected around the umbilicus, but follows the median line above it.

Since much handling and bruising of the edges of the abdominal incision is unavoidable it is well to insert several temporary sutures on each side, uniting the peritoneal and skin margins of the wound. The ends of these sutures are left long and tied together, so they may be utilized as retractors of the abdominal wall.

The Trendelenburg position is frequently a great aid in these operations by disposing of the intestines and affording a free field for convenient and rapid work. It will not be necessary in all cases, however, since the horizontal position is sometimes more advantageous, and it is not required until this stage when the work of removing the tumor begins. It is impossible to formulate any rule governing the position of the patient. The operator must select that most appropriate and convenient in individual cases.

The next step will depend upon the size of the tumor or tumors to be removed, their situation, their relative position to the uterus and to each other, their mobility, and the nature of their attachment to the uterus.

If the tumor and uterus are wedged in the pelvic cavity it may be necessary to sever its attachment with the uterus

before the tumor can be extricated. The possibility of sharp hemorrhage must then be guarded against in the best manner possible. If the pedicle has sufficient length, a stout clamp is fastened securely upon it, and it is then severed to the outer side of the clamp by means of a pair of strong scissors or a scalpel, as will be found most convenient. The clamps used for this purpose should have ridges or serrations running lengthways of the blade, instead of transversely, to prevent slipping. (See Fig. 105.) The ordinary clamps with transverse serrations are useless in these cases. If the pedicle is short it may be necessary

Fig. 105. Pedicle clamp with longitudinal serrations or ridges on the inner surface of the blades to prevent slipping.

to encroach upon the tumor tissue in separating it from the uterus, and if too short for the application of the clamp a stout silk ligature is passed temporarily around it and tied firmly. The ligature applied to the pedicle is liable to slip, to avoid which it should penetrate the pedicle at some point or several points, preferably near the circumference, a stout needle being employed for this purpose. In such cases the incision for detaching the tumor should be made some distance from and to the outer or tumor side of the ligature through the tumor structure. Before detaching the tumor a corkscrew or a strong volsella forceps is fastened securely into the tumor, and a volsella is fastened securely into the fundus also, so that the uterus can be quickly dragged out of the pelvis, that the stump may be conveniently reached, and hemorrhage promptly controlled if the ligature proves insufficient. The method of dealing with the stump of the pedicle will be described further on.

If the tumor is large and has developed up into the abdominal cavity, dragging the uterus with it and displacing

the abdominal viscera, it may be necessary to sever the pedicle before lifting it out to avoid extending the abdominal incision unnecessarily. In these cases the vessels in the pedicle are often large, and much loss of blood would result if the clamps were to slip or prove insufficient. It is, therefore, very unwise to trust wholly to the clamps when it can be avoided. A temporary ligature of strong silk is made to encircle the pedicle below the clamps. To prevent slipping it is quilted into the tissue around the circumference of the pedicle, as described for ligating the pedicle in vaginal ovariotomy. When the pedicle is short this ligature may even encroach upon the uterine structure.

If it is possible to pass a temporary rubber ligature around the cervix or the body of the uterus below the attachment of the tumor this should be done; the ligature

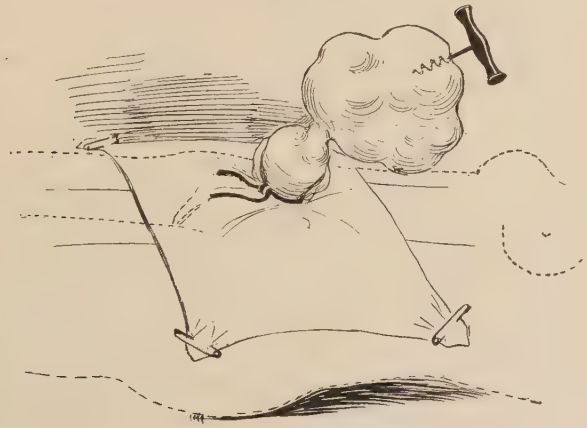


Fig. 106. Showing rubber protective sheet and rubber ligature in position tumor and part of the uterus delivered out of the abdomen.

around the pedicle and even the clamp may then be dispensed with. The tumor is lifted out of the abdomen by means of a corkscrew as described above.

When the tumors are smaller or the pedicle is short, the rubber ligature must first be placed around the cervix, or body of the uterus, well down below their attachment, so

as to compress the uterine vessels and cut off the blood supply until the tumor is detached and the vessels supplying it through the pedicle have been secured. The tumor, with as much of the uterus as possible, is drawn out through the abdominal incision; then a protective rubber sheet (Fig. 104), having a perforation in its center, is stretched over the whole (uterus and tumor) and crowded down to the level of the rubber ligature. (See Fig. 106.) If the mass is too large to admit of its application in this manner, the rubber sheet is split up on one side from periphery to center and placed around the cervix or uterus, as the case may be, in the same manner as a cape is placed around the neck, and then it is lapped over and pinned with safety pins. The four corners of this rubber sheet are pinned to the towels surrounding the abdomen (Fig. 106). When placed properly in position this sheet covers the abdominal incision and whole abdomen, hence protects the intestines and peritoneal cavity during the removal of the tumor and subsequent manipulations. The work from this point on is carried on practically outside of the peritoneal cavity, which is kept dry and clean.

Smaller tumors, so situated that they may be delivered through the abdominal incision before their removal, are seized with strong volsella forceps, drawn out with the uterus, and the rubber ligature and rubber sheet are placed in position. The pedicle is then divided by a V-shaped incision, making a flap on each side as represented in Fig. 107. If the flaps are too redundant they are trimmed off, leaving just enough to cover the wound and permit the edges of the peritoneum to roll in where they come together.

The vessels supplying the tumor are usually found on the periphery of the pedicle just under the peritoneal covering. These are secured by passing a curved needle with a fine chromicized catgut ligature under them, a short distance back from the margins of the flap or on the surface of the uterus, and tying it on the peritoneal surface. This avoids leaving a knot in the wound.

When a vessel penetrates the center of the stump it must be picked up with long pointed pressure forceps and ligated by passing a ligature around it by means of a curved needle, which is made to include some of the adjacent tissue to prevent slipping. It is then impossible to avoid leaving a knot in the wound.

Before closing the incision the rubber ligature around the cervix should be loosened to see if all bleeding points

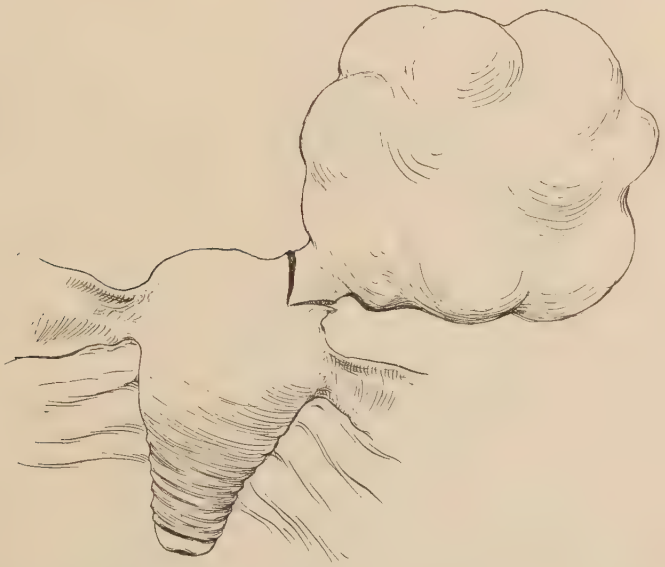


Fig. 107. Showing formation of flaps in dividing the pedicle for removing subperitoneal pedunculated fibroid tumors.

have been secured. Oozing may be disregarded and will be checked by the compression of the sutures used for closing the wound.

If the pedicle is thick and short it may be necessary to encroach upon the surface of the tumor to secure sufficient peritoneum for covering the wound made by removing the tumor. The flap is made in the same manner as described above, but the first incision on each side extends only

through the peritoneum which is stripped down on each side until the base of the pedicle is exposed. This is then divided either on a level with the uterine wall or by means of a shallow V-shaped incision.

Where it has been necessary to divide the pedicle within the abdominal cavity before the tumor can be extricated, as in the case of very large tumors and those wedged in the pelvis, after the tumor has been lifted out of the way the uterus is drawn up into the wound in a position exposing

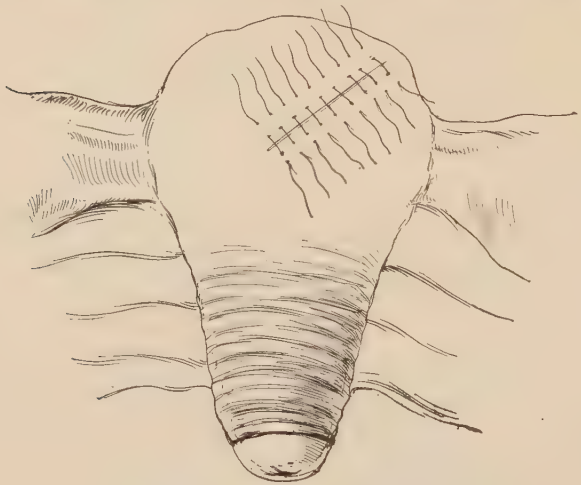


Fig. 108. Showing method of inserting the superficial sutures for approximating the peritoneal margins of the incision in the uterine wall.

the stump of the pedicle most conveniently. The rubber ligature is then placed around the cervix or body of the uterus, and when thought necessary the rubber protector is adjusted also. The vessels around the base of the pedicle are ligated as described above, by passing a ligature under each and tying it on the peritoneal surface. The clamp securing the pedicle and temporary litgature, if one has been employed, is now removed, and the remaining pedicle is split in the longest diameter by a V-shaped incision, forming flaps to cover the wound.

When the incision does not extend deeply into the uterine wall one row of superficial interrupted sutures will be sufficient for closing it. The material used is fine (No. 1) chromicized catgut, and the sutures are inserted as represented in Fig. 108, so they will roll in the peritoneal edges when they are tied. This form of suture covers up all the raw surface, and by approximating the peritoneal surface of the margins of the flap secures prompt union,

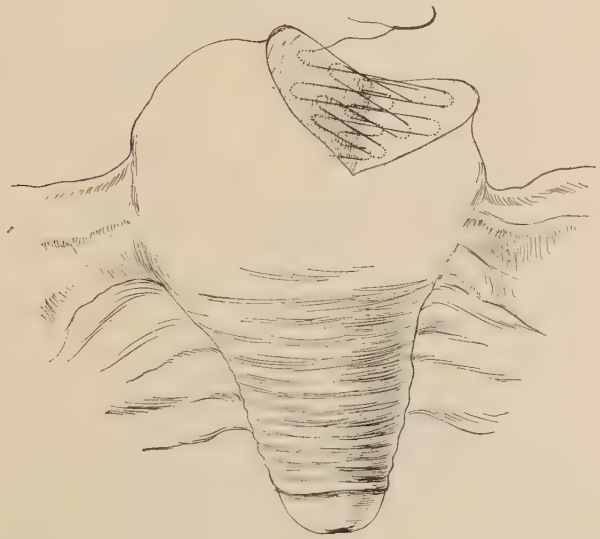


Fig. 109. Showing method of inserting deep sutures for closing the wound in the uterine wall made by the enucleation of the pedicle of deep seated tumors.

and obviates adhesion of adjacent peritoneal surfaces to the line of incision.

If the incision extends deeply into the uterine structure it will be necessary to introduce deep buried sutures for approximating the sides of the wound. The technique of their introduction will be described under the enucleation of sessile and interstitial tumors. (See Fig. 109.)

When the sutures have all been tied the surface is washed off with warm normal salt solution, the rubber ligature is removed, and the table is lowered to a horizontal position, if the inclined position has been utilized during the operation. This is important before returning the uterus into the abdominal cavity to see if all oozing has been controlled. If bleeding points are discovered, ligatures are passed under them a short distance from the margin of the wound and tied. All bleeding must be positively checked before closing the abdominal wound. Drainage of the peritoneal cavity will not be required if proper care has been exercised during the various steps of the operation.

Enucleation of Sessile and Interstitial Tumors.

Before opening the abdomen the uterine cavity must be curetted as thoroughly as possible, and irrigated, first with a one per cent. solution of lysol to remove clots and detached membrane, then with a solution of iodine (one ounce of the compound tincture to a quart of water) to check oozing and render the cavity aseptic. This is essential, as the cavity may be opened during the enucleation of a tumor from its bed in the uterine wall. The discoloration produced by the iodine is an advantage also, because it serves as a guide when the cavity has been entered or is closely encroached upon. A double current irrigator of unusual length and small size will be necessary on account of the length of the canal and its narrow calibre in places. The clinical irrigator shown in the chapter on curettage of the uterus (Fig. 22) will serve the purpose.

Unusual care must be observed in using the curette in these cases to avoid penetrating the uterine wall, which is sometimes very thin in places. When the canal is tortuous or distorted by projecting growths it may be extremely difficult to reach all parts of the cavity with the curette, and a careful exploration with the sound previously may be necessary. For the technique of curettage in these cases see chapter on "Curettage of the Uterus."

When the abdominal cavity has been opened the hips are elevated to get the intestines out of the way; then broad, thin gauze pads are inserted to keep them back, and the hips may be lowered again if the horizontal position is found more convenient. The rubber protective dam is now placed around the cervix or as low down on the uterus as possible, and the rubber ligature is applied, the uterus be-

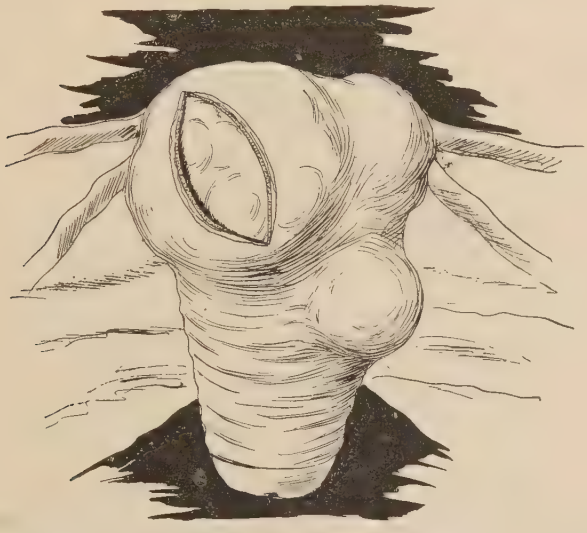


FIG. 110. Showing method of incising the covering and capsule of the tumor by double incision.

ing delivered out of the abdomen as far as possible. When delivery of the uterus with tumors is not possible it may be difficult to adjust the rubber protective sheet, in which case the intestines and remainder of the exposed peritoneal cavity must be protected and walled off from the field of operation by carefully arranged gauze pads.

The largest tumor is removed first to determine the amount of uterine structure to be sacrificed, and if sufficient will remain after all have been removed to justify a myomectomy. Sessile tumors are usually distinctly encap-

sulated and are easily shelled out. When large, the capsule is opened by two curved incisions across the top of the tumor, in the direction of the long axis of the uterus, extending nearly to the limit of the tumor at each angle, making an oval (see Fig. 110) which gives more room for its delivery. When small, a single incision deep enough to split the capsule and extending to the extreme limit of the

Fig. 111. Method of enucleation of tumor with handle of scalpel.

tumor at each angle will suffice. (See Fig. 112.) The handle of the scalpel or a pair of flat, curved, blunt scissors closed may be used as an enucleator. Inserting the instrument between the severed edges of the capsule and the tumor, as shown in Fig. 111, it is forced all around and under the tumor, separating it from its capsule, while the

uterus is grasped with the disengaged hand and compressed to aid the expulsion. A somewhat irregular relaxed cavity (Fig. 112) is left behind, which is at once packed with gauze to control oozing until all the other tumors have been removed. There will be little or no bleeding if the rubber ligature has been placed around the uterus or cervix, and when this is loosened, after all the tumors have been removed, to reveal the location of bleeding points, it will be found to proceed from several vessels on the surface of the uterus. These are secured by ligatures of fine catgut passed under the vessel a short distance from the margin of the incision, using a small, curved, round-pointed needle for this purpose.

When all the tumors have been removed the gauze is removed from the cavity left after removing the first, and each is closed in succession by buried sutures of fine chromicized catgut inserted by means of a small, short, curved needle. Beginning at the upper angle the needle is inserted upon the peritoneal surface a short distance from the margin of the incision near the angle (see A, Fig. 113), and is brought out in the wound or cavity near the bottom. The suture is drawn through to within three inches of the end, which is grasped with a pair of pressure forceps near the surface of the uterus. (See Fig. 113.) The needle is next inserted on the opposite side of the wall of the cavity near the bottom, and when the suture is drawn through, the bottom of the cavity at that point for a small space will be brought together. Continuing this suture in this manner all the way down the bottom of the cavity, catching it first on one side, then on the other, the whole base of the cavity is closely approximated. (See Fig. 113.) When the lower angle is reached, the suture is not brought out on the peritoneal surface but is continued back to the upper angle again, catching the wall of the cavity, first on one side and then on the other above the first row of sutures. When this second tier of sutures is tightened the first tier is covered over and buried out of sight, and the cavity has been made much smaller and more shallow.

Tier after tier of sutures is inserted in this manner until the cavity has been completely closed and only the severed margins of the peritoneum covering remain unapproximated. It is very necessary to insert the sutures and each tier close enough together to form perfect coaptation of the walls of the cavity, especially at the angles, so as to

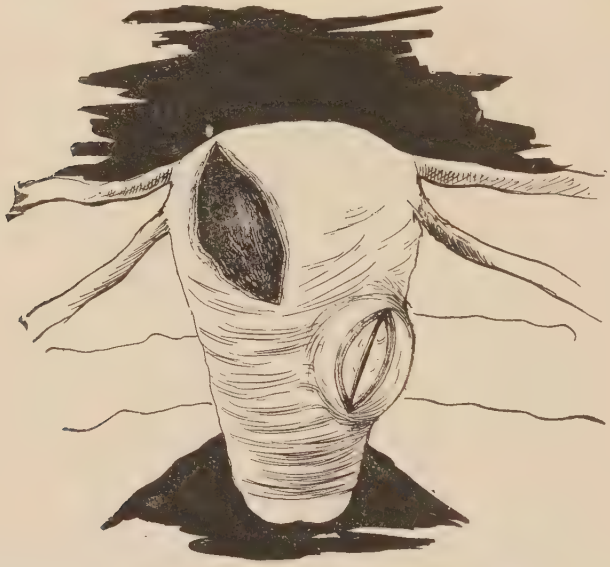


Fig. 112. Showing empty cavity after enucleation of a tumor at the upper left hand corner of the uterus, and at the lower right side a straight incision through the covering and capsule for exposing smaller tumors.

avoid leaving spaces where blood or serum may collect and cause subsequent trouble. When the last tier has been inserted the end of the suture is brought out on the peritoneal surface at the upper angle, at a point opposite the original insertion, and this end is tied with the other across the upper angle of the incision. (See B, Fig. 113.) The only knot is, therefore, on the peritoneal surface, and none has been made or left in the wound or cavity.

The peritoneal margins are next united by a row of in-

terrupted Lembert sutures of fine catgut, placed closely together, as represented in Fig. 108. If there is any redundancy of tissue when the margins are brought together, it is trimmed off before these sutures are inserted. Likewise all loose tissue or partially detached shreds in the cavity are removed before inserting the deep sutures.

Interstitial tumors are usually more difficult to enucleate. They are situated more deeply in the uterine wall, their covering is thicker, and they are not always distinctly encapsulated. In some instances they encroach upon or pro-

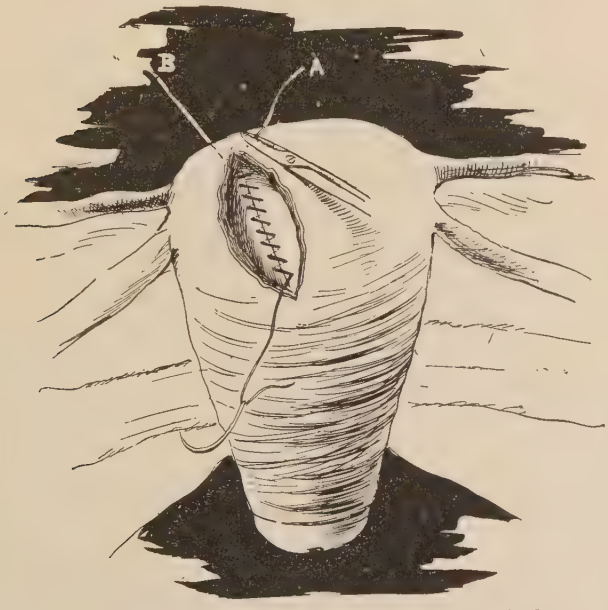


FIG. 113. Showing method of closing the cavity from the bottom by continuous tiers of buried sutures. The suture is first introduced upon the surface of the uterus and caught with pressure forceps, A. When the cavity is closed, except the peritoneal margins, the suture is brought out on the uterine surface again, at B, and these two ends are tied together.

ject into the uterine cavity, and it is impossible to remove them without opening into it. This is not, however, of much consequence if care is taken to avoid sepsis from this

source. The opening may be utilized to secure drainage into and through the uterus from the tumor cavity, when this is necessary.

The method of exposing the tumor for enucleation will depend upon its size and situation. When small, a single, straight incision is made over the center of the mass, avoiding conspicuous vessels on the surface, and severing the whole thickness of the uterine wall covering it. The curved, blunt scissors is the best enucleator in these cases, and when the tumor cannot be readily detached from the

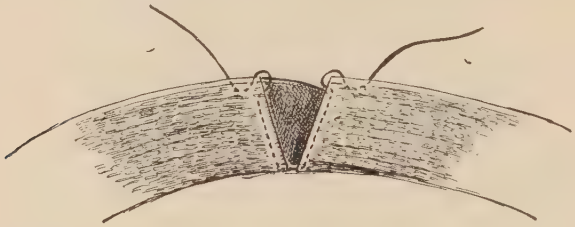


FIG. 114. Showing method of introducing sutures through the whole thickness of the uterine wall, so as to roll in the peritoneal margins and secure perfect coaptation.

surrounding wall the attachment is cut. When the uterine wall covering it has been divided and the tumor exposed it is separated for a distance all around, then it is seized with a strong volsella or blunt bullet forceps, and retracting the uterine walls, traction is made upon it, while the enucleation is proceeded with. Considerable dissection with the scissors will sometimes be necessary before the tumor can be removed. The remaining cavity is closed with buried sutures in the manner described above. Close approximation of the walls will prevent subsequent bleeding, and few, if any vessels will require ligature except on the uterine wall covering the tumor.

When the uterine cavity is opened it is packed immediately with iodoform gauze, an end or loop of which is carried down through the cervix into the vagina, and the tumor cavity is closed over this in the usual manner, as described above. When the first row of suture is inserted

care must be taken not to include the mucous membrane in the suture loops, which at no place must be exposed in the uterine cavity. The suture should go down to, but should not penetrate, the endometrium. The other tiers of suture are inserted in the manner above described. The in-

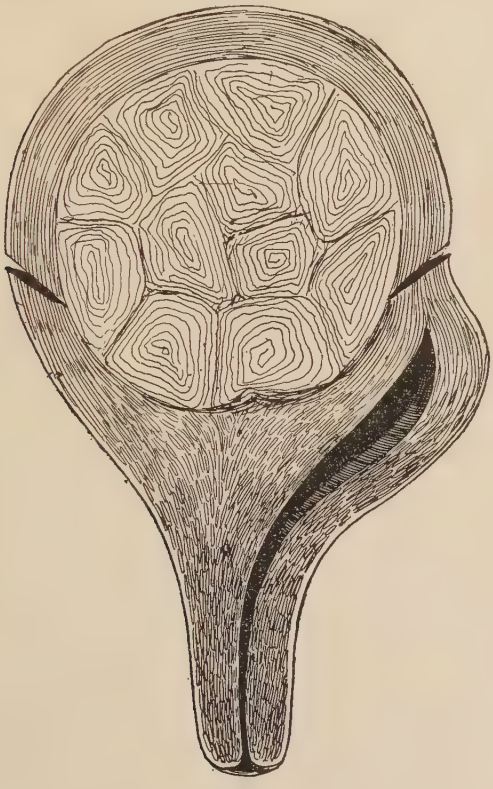


Fig. 115. Showing large interstitial myoma and method of enucleation.

cision in the uterine wall is closed preferably by deep interrupted sutures which include the whole thickness and are tied on the surface, but care must be taken to turn in the peritoneal margins as each suture is tied. A very satisfactory suture for this purpose, which, so far as I know, has

not been described before, is represented in the accompanying illustration, Fig. 114. A little longer time is required for its introduction than the ordinary deep suture, but it has the distinct advantage of rolling in the peritoneal margins and securing perfect coaptation.

When an interstitial tumor is very large and is greatly in excess of the uterus proper, as represented in sectional view, Fig. 115, an incision is made on each side well down near the uterus, and the uterine wall covering the tumor is removed with it. (See Fig 115.) The tumor is separated from the uterus in the manner described above, and the opposite walls of the remaining cavity are approximated with tiers of buried sutures. The margins A A, in the figure, are thus brought into apposition, and the deficiency in the uterine wall made by the removal of the tumor is bridged over.

Large vessels on the surface of the uterus will be unavoidably divided in these cases, and must always be securely ligated before the cavity is closed. Before tying the sutures, uniting the peritoneal margins, the rubber ligature should be temporarily loosened to expose severed vessels which may have been overlooked. The ligature is again loosened before the uterus is returned into the abdominal cavity, and after the hips have been lowered so as to avoid any possible chance of hemorrhage after the abdomen has been closed.

Before removing the rubber protective sheet the surface of the uterus is washed carefully with hot normal salt solution, and all oozing from the wounds should be arrested. If not sufficient to require a ligature, hot compresses should be applied. If the abdominal cavity and intestines have been properly protected by the rubber dam, it will not be necessary to cleanse or flush it, but if the abdominal cavity is filled with hot sterile normal salt solution before the abdominal incision is closed, the chance of adhesions of the intestines to the uterus is greatly diminished.

When the operation is properly executed there will be no necessity for drainage of the peritoneal cavity. Whenever

it is necessary, however, it is secured by an incision in the vagina posterior to the uterus, opening into Douglas's pouch.

Removal of Large Submucous Fibroids Through an Abdominal Incision.

Where these intra-uterine tumors are too large to be removed by the vagina through the dilated cervix, they may be removed through an abdominal incision in the same manner as the foetus in Caesarean section. This is unquestionably a more surgical procedure than morcellation, when the tumor is very large and its attachment broad. The rule is, when the tumor is as large or larger than the foetal head at term this operation is indicated. When, however, the cervix is readily dilatable and the tumor is attached by a narrow pedicle, that can be reached and divided, very large tumors may be removed through the vagina, "piece meal," with greater safety than through the abdomen. But when the attachment is extensive, and especially when the tumor is developed partly in the uterine wall, as well as within the cavity, morcellation is not to be considered.

The preparation for the operation is the same as heretofore described. Before opening the abdomen the vagina is cleansed, the cervix dilated for subsequent drainage, and the uterine cavity, so far as it is accessible, is irrigated with an antiseptic solution.

The abdomen is opened by a median incision sufficiently long to deliver the uterus through it. The rubber ligature is placed around the cervical portion of the uterus as low down as possible, and the rubber protective sheet, Fig. 104, is arranged in position below the ligature to prevent soiling the peritoneal cavity. A longitudinal incision is made in the anterior uterine wall from just below the fundus to within a short distance of the rubber ligature around the cervix, opening into the uterine cavity and exposing the tumor. (Fig. 116.)

It is well to be satisfied that the tumor is not a suppurating myoma before this incision is extended the full length, and if it prove to be, the incision must be closed by temporary sutures and the whole uterus, with the exception of the

Fig. 116. Showing large submucous fibroid within the uterus after incision of the uterine wall preparatory, to its removal.

cervix, should be taken out. To attempt to remove a mass in that condition would involve too much risk of infection, and myomectomy should be abandoned.

The margins of the uterine incision must be carefully protected from contact with the contents of the uterus and from handling, by covering them with gauze pads packed

in between the tumor and uterine wall and folded back over them. The tumor is then rapidly separated all around from the uterine wall with finger and closed scissors until the pedicle or base of the tumor is reached. This is rapidly detached with blunt, flat, curved scissors, severing it close to the uterine wall.

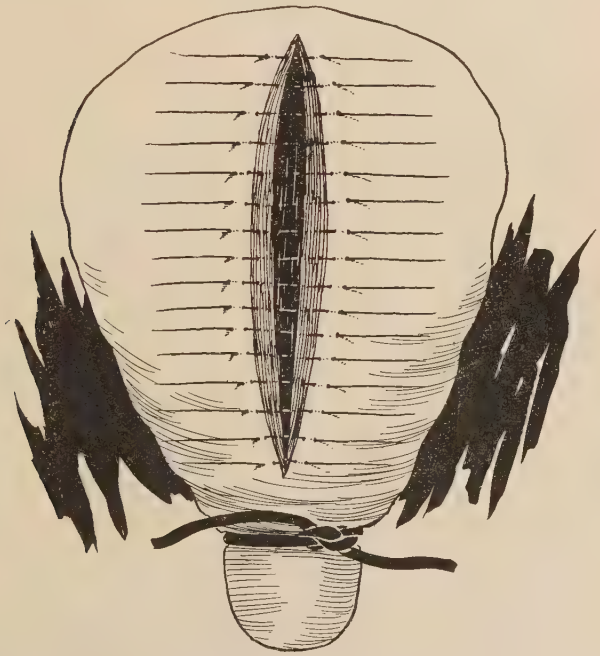


Fig. 117. Showing incision in the uterine wall after removal of the tumor, and interrupted sutures introduced for closing it. This is the deep suture shown in Fig. 114.

If the tumor is wholly within the cavity this is readily done, but where it lies partly imbedded in the uterine wall it will be more difficult. The capsule is then cut through all around the base of its attachment, and the tumor is enucleated with the scissors closed, in the same manner as an interstitial growth. The cavity remaining is not closed, but left open for drainage into the uterine cavity. When there

is much bleeding from the surface from which the tumor has been detached, it is well to pack the cavity with a large strip (a yard or more) of iodoform gauze, letting one end protrude through the cervix into the vagina, and closing the uterine wall over it, as will be described below. If there is not much bleeding, a rubber drainage tube of large calibre is passed down through the cervix into the vagina, and after the incision in the uterine wall has been closed the cavity may be irrigated through it with an antiseptic solution.

Before closing the incision in the uterine wall the margins are flushed with warm normal salt solution, this being done before if gauze is to be inserted into the cavity. The incision is closed by means of interrupted deep sutures of fine chromicized catgut inserted, as shown in Fig. 114, through the whole thickness of the uterine wall, about three-quarters of an inch apart. (Fig. 117.) These sutures extend down to, but do not include, the uterine mucosa. If any intervening portion of the peritoneal margins remains imperfectly approximated after all the sutures have been tied, superficial Lembert sutures are inserted where necessary.

The uterine wall is next examined carefully for small nodules, and these are removed, and the incisions made and cavities remaining after their enucleation are closed as heretofore described.

The uterus is then douched freely with warm normal salt solution to cleanse the surface, and the rubber sheet and ligature are removed. If there is no oozing from the wound the uterus is returned into the pelvic cavity. When oozing points are discovered a chromicized gut ligature is passed under each bleeding vessel, a short distance from the margin of the wound, and tied.

The abdominal cavity has been so thoroughly protected by the rubber sheet that it does not require cleansing, and drainage is not necessary. The wound is, therefore, closed and dressed in the usual manner, as described in the chapter on this subject.

The after-management of these cases consists chiefly in draining the uterine cavity and keeping it clean by irrigation. If gauze has been inserted this is removed at the expiration of forty-eight hours, and the cavity is carefully irrigated with the aid of the long double-current irrigator. If at this time there seems to be necessity for it, a rubber drainage tube is inserted through the cervix up into the cavity. But if the canal is free enough for drainage this may be dispensed with and irrigation practiced every two or three days as required. If the rubber drainage tube is inserted at the time of operation it is removed at the end of forty-eight hours, as it may become blocked by clots and debris. The cavity is then irrigated and, if required, a fresh tube is inserted. Irrigation of the cavity is to be continued as long as there is anything found to be washed away.

The patient is not usually confined to bed for more than three weeks, and the convalescence is generally rapid and uninterrupted. Under proper aseptic precautions and careful operative technique the mortality in these cases should not exceed that of hysterectomy, and the gain to the patient is so much that there should be no hesitancy about preferring it to that operation.

CHAPTER XXIII.

VAGINAL MYOMECTOMY.

Small sessile or subperitoneal fibroids situated on the anterior or posterior wall of the uterus may be removed through a vaginal incision either anteriorly or posteriorly to the cervix, opening into the peritoneal cavity. If they are causing sufficient inconvenience or are increasing rapidly in size, these tumors may be thus disposed of and an abdominal section later on avoided. This procedure must, of course, be limited to growths sufficiently small to be delivered through a vaginal incision extending half way around the cervix on each side. It is a simple operation, attended with very little risk, yet the whole uterus has been removed for no other offense than the existence of a tumor upon its wall no larger than a walnut. It is a question if it is not wiser to remove these small growths whenever they are discovered before they have attained a size to require a more serious operation, even if they are not giving any inconvenience.

Preparation of the Patient.—The intestinal tract should be thoroughly cleansed several days before the operation, and the liver and kidneys should be made functionally active. The bowels must be acted upon by a cathartic given the night before, and the colon must be washed out with copious enemata the day of the operation.

The evening preceding the operation the vulva and pubes are shaved and washed with green soap, and the vagina is irrigated freely with a one per cent. solution of lysol. Repeatedly during this irrigation the vulva should be compressed between the thumb and fingers so as to close it, and distend the vagina with the solution, when the pressure is removed suddenly, permitting it to escape with a gush. This is the only effectual method of cleansing the vagina with the douche. Afterwards the vagina is filled with moist

or dry markasol gauze* to catch the discharge from the uterus and protect the surface. Being antiseptic, this gauze also aids in establishing an absolutely aseptic condition of the vaginal surface, and it is perfectly non-irritating. A pad of the same gauze dry is applied against the vulva and held in place by a T binder. This is not removed until the patient is placed on the operating table, the bladder being emptied when necessary by catheter.

The patient is placed upon the operating table on the back, with the buttocks well down over the edge, the thighs being flexed upon the abdomen abducted, and the legs supported by a crutch or leg-holder.

The vulva pad and gauze in the vagina are now removed. As an additional precaution in the interest of asepsis, the vulva and surface of the buttocks surrounding, with the anus, are again scrubbed with green soap. The vagina is also scrubbed with green soap and a pledget of cotton in the grasp of a long handle dressing forceps, the soap being washed away by copious irrigation with a one per cent. solution of lysol, warm. Then a sterile towel, wrung out of the same solution, is stretched across the buttocks on a level with the posterior commissure of the vulva, and pinned to the clothing on each side to obviate contact with the anus during the operation. Towels wet with the same solution are placed, one over the lower abdomen and one over each thigh. In this manner exposed parts which are not sterile are protected from accidental contact with hands or instruments.

Instruments Required.—Cervical dilator; angular tenaculum forceps; bullet forceps tractor; three curettes, one medium and one small, both dull, and one sharp; uterine dressing forceps; uterine packing forceps; long curved scissors, blunt; long curved scissors, pointed; one-half dozen hemostatic clamps; tenaculum; vaginal retractor; needle holder with long handle; scalpels, two, in case of accident to one; volsella; sponge holder forceps, six

*In the absence of this gauze the surface is dusted with dry markasol, and plain sterile gauze is substituted.

pair. In addition there will be needed half dozen short quarter-curved needles; leg holder or Clover crutch; chromicized catgut, No. 1, and plain catgut No. 2; a spool of stout linen thread, sterilized, or stout silk for traction ligatures.

Two assistants and two nurses besides the anaesthetizer are required.

The first assistant stands to the left of the patient, facing the operator, who sits facing the field of operation. In assisting he bends over between the knees of the patient.

The second assistant is utilized for passing instruments, preparing ligatures, and threading needles.

The first nurse sits on the left of the operator, and holds the perineal retractor in her right hand, which with the forearm is wrapped in a sterilized towel.

The second nurse looks after the solutions, pads and sponges.

The operator sits facing the field of operation on a chair or stool of convenient height, with a sterilized towel across his lap, upon which he deposits from time to time instruments he is using. A foot stool is placed at the end of the table, upon which he rests his feet so as to elevate the knees, thus preventing the instruments from slipping off. A hand douche of lysol solution is placed conveniently to his right, the solution being changed from time to time during the operation, as required.

Technique of the Operation.—A short, broad perineal retractor* is introduced and given to the nurse to hold in her right hand as she sits to the left of the operator. The cervix is now dilated, the uterine cavity is curetted and irrigated freely with a one per cent. solution of lysol (see chapter on curettage of the uterus), and the cavity and cervical canal are packed with iodoform or markasol gauze. A stout ligature is then inserted through both lips of the cervix and tied firmly, thus closing them over the gauze and preventing the escape of blood or secretion from the cavity

†It is very necessary that this retractor should have a short vaginal portion to allow the uterus to be drawn down.

or canal during the operation to follow. (See Fig. 118.) The ends of this ligature are tied together, and it is utilized as a traction ligature.

If the tumor to be removed is situated on the posterior wall of the uterus, the incision is made posteriorly to the

FIG. 118. Showing traction ligature in the cervix and incision in the vaginal wall posterior to the cervix.

cervix at the cervico-vaginal fold. The uterus is drawn down and up against the base of the bladder by means of the traction ligature, which is given to the assistant to hold. Then a tenaculum is inserted upon the vaginal portion of the cervico-vaginal fold at the center, and with curved scissors the vaginal incision is extended half way around the cervix on each side, following the line of the cervico-vaginal fold. The incision penetrates the vaginal wall only, opening into the

connective tissue beneath. Now, with the scissors closed or the thumb nail, this flap is peeled back from one angle of the incision to the other, hugging the uterus and separating it from the rectum, until the peritoneum at the bottom of Douglas's pouch is reached. This is divided with scissors, opening the peritoneal cavity, and the incision is extended laterally to the limit of the vaginal incision on each side. The posterior or rectal margin of the peritoneum is caught by the tenaculum and drawn down to the posterior margin of the vaginal incision, and temporary sutures are inserted so as to approximate these two margins, one in the center and one on each side midway between the center and the lateral angle of the incision. The ends of these sutures are left long and tied together, so they may be utilized as traction ligatures. They serve also to protect from handling the tissues divided, which frequently interferes with prompt union of the incision.

During this stage of the operation there may be considerable bleeding from small vessels divided, but it may be disregarded until the peritoneum is reached and the cavity opened; when the temporary ligatures referred to above are inserted and tied this bleeding will cease.

One or two fingers are now inserted and the tumor located, while with the other hand pressure is made upon the hypogastrium to crowd the uterus lower down in the pelvis. The uterus is then retroverted and the tumor brought into view in the incision. (See Fig. 119.) Seizing the projecting growth with the steel bullet forceps tractor, the covering and capsule are incised if it is a sessile growth. The bullet forceps are then detached and fixed in the tumor proper, as it shows through the incision in its capsule. With the curved blunt scissors it is enucleated from its bed and removed by traction with the bullet forceps. If these prove insufficient the volsella is used.

If the growth is pedunculated the pedicle is severed close to its attachment to the uterine wall by a V-shaped incision, the tumor being delivered through the incision first. All the while the assistant is making pressure upon the hypo-

gastrium to keep the uterus crowded down upon the incision, which prevents it from receding after the growth has been removed.

Sometimes it will be necessary to introduce a tampon into the peritoneal cavity to push back the intestines and keep them out of the way before the uterus is retroverted. This should be a tampon of sterile absorbent gauze with a

FIG. 119. Posterior margin of the incision retracted, exposing the tumor.

stout, strong ligature attached securely around its center, so that it may be withdrawn outwards. A pressure or hemostatic clamp is attached to the end of this ligature to prevent it being lost or carried into the peritoneal cavity during subsequent manipulations. If the hips are elevated, as in the Trendelenburg position, for a few moments after the peritoneal cavity has been opened, the intestines will gravitate out of the field, and the patient may then be lowered to the horizontal position again. Then, if the uterus is retroverted before they return, the introduction of the tampon may be avoided.

The next step will be closing the cavity in the uterine wall remaining after the removal of the tumor. In the case of sessile growths a buried continuous suture of fine chromicized catgut is used, beginning at the bottom of the cavity as described in dealing with the same cases through an abdominal incision. If the tumor removed was pedunculated the stump is closed by a continuous suture of chromicized catgut inserted superficially, but introduced deeply enough to secure complete coaptation. The oozing is controlled by the sutures. For introducing these sutures a short curved needle will be required.

The uterus is now replaced, and if a tampon has been introduced it is withdrawn by careful traction upon its ligature, taking care to free it from loops of intestine which may adhere to it and may otherwise be drawn through the vaginal incision with it. Next, the two outer temporary sutures or traction ligatures, which were introduced, uniting the posterior peritoneal margin with the margin of the vaginal incision, are cut and removed. The central suture is, however, left until the permanent suture is introduced.

If the tumor is situated on the anterior uterine wall the incision is made in the same manner anteriorly to the cervix. After opening the vaginal wall, half way around the cervix on each side, the dissection is extended upward carefully, with the thumb nail separating the bladder from the uterine wall, hugging the uterus closely all the while, to avoid wounding the bladder. When the vesico-uterine fold of peritoneum is reached this is divided, opening the peritoneal cavity. The incision is enlarged laterally, and the tumor is brought into view by pressure upon the hypogastrium, crowding the uterus forward. The after steps are the same as when the opening is posterior to the cervix.

The vaginal incision is closed by a continuous catgut suture from one angle to the other, introduced so as to include and approximate both peritoneal margins—that on the posterior surface of the uterus and that on the rectal surface. Beginning at the angle of the incision on the left, the needle (a short curved one) is inserted on the vaginal

surface, penetrates the vaginal wall, then both peritoneal margins, and comes out on the lateral surface of the cervix near the margin of the incision, and is tied. Each subsequent insertion of the needle makes a loop which includes the same structures every time, and when the center of the incision is reached the remaining traction liga-

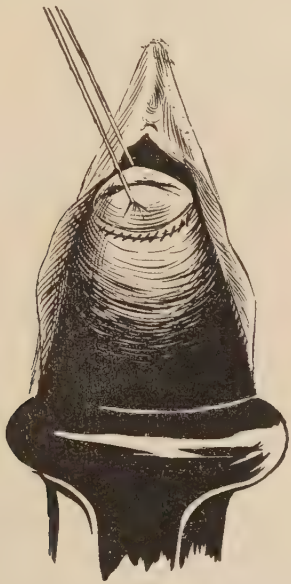


FIG. 120. Showing incision closed with continuous suture on completion of the operation.

ture is removed. Then the suture is continued to the angle on the right, when the whole length of the incision is closed and the suture is again tied.

If absolute asepsis has been preserved throughout the steps of the operation, drainage will not be required, and irrigation of the wound before it is closed will not be necessary, but there is no objection to irrigation with normal salt solution which will remove small clots from the surface and favor primary union.

The vagina is packed loosely with moist iodoform gauze, or dusted freely with markasol and dry absorbent gauze inserted. This is permitted to remain forty-eight hours, when it is removed, and usually no other dressing is required. Vaginal douches are not used unless indicated by some discharge, when a one per cent. solution of markasol may be employed once a day if necessary.

The patient is kept in bed for two weeks, when, if all has gone well, and the vaginal incision has united, she may be permitted to sit up.

CHAPTER XXIV.

VAGINAL ENUCLEATION OF SUBMUCOUS FIBROIDS.

This method of removing these growths is applicable to all submucous fibroids attached by a pedicle when it is possible to reach the pedicle through the dilated cervix, even if it is necessary to divide the cervix. It is also appropriate for the removal of sessile tumors projecting into the uterine cavity when the growth or its base of attachment can be reached.

If the tumor is very large, however—larger than the foetal head—it would be wiser to remove it through an abdominal incision into the uterus.

If the tumor is sloughing, causing exhausting hemorrhages, or is suppurating, this procedure is appropriate for immediate relief, though there may be other growths in the uterine wall. These may be left to be dealt with later when the patient has regained sufficient strength.

Fortunately, when these pediculated tumors have attained sufficient size to distend the uterus, the cervix is often found dilated, or so much softened by pressure of the tumor downward from within the cavity as to be readily dilated, and it can be easily delivered through it into the vagina. Yet in many instances the canal is closed and the cervix is firm, necessitating artificial dilation before the tumor can be reached and removed. Sometimes it will be necessary to divide the cervix laterally after dilatation has been pushed to the limit, in order to gain access to the point of attachment or to extract the tumor after it has been detached. The divided cervix is immediately united by silver wire sutures introduced in the same manner as where the operation is done for repair of lacerated cervix.

Preparation for the Operation.—This operation is not of sufficient gravity to necessitate prolonged preparation of the patient other than that required for the administration of the anaesthetic, yet when it is not urgently demanded by hemorrhage or a suppurative process it is better to get the patient in as good condition as possible before it is undertaken.

The local preparation must always be as thorough as when a vaginal section is to be done. The vulva must be shaved and scrubbed with green soap, and the vagina must be scrubbed also, as heretofore described. The patient is placed upon the table in the dorsal position, with legs supported with the crutch or leg holder, and the hips are drawn well down over the edge. A perineal retractor is then inserted, and is held by the nurse as described for vaginal myomectomy. The uterus is drawn down by an angular tenaculum forceps or bullet traction forceps, fixed into the vaginal portion of the cervix on each side. When dilatation has been effected the uterine cavity, so far as is practicable, is irrigated with an antiseptic solution before it is invaded to locate the point attachment.

Dilatation of the Cervix.—If the cervix is soft and the tumor is projecting into the canal, or has stretched the internal os, as the foetal head does in the first stage of labor, manual dilatation with the patient under anaesthesia can often be pushed far enough to permit delivery by traction. But if dilatation cannot be accomplished in this manner, a rectal speculum with wide expansion may be utilized, the cervix being drawn well down to the vulva for insertion of the blades. The dilatation must be effected slowly to avoid injury. If it does not yield readily it would be better to divide the cervix laterally than to use enough force to tear it. The dilatation may be facilitated by seizing the tumor and dragging it down into the canal, and if its structure is friable and tears readily, a loop of tape may be passed up around it, beyond its largest diameter, and traction is made with this. To accomplish this, either a pair of curved long handle dressing forceps or a forked crutch, designed espe-

cially for this purpose, may be employed. To equalize the traction, two of these loops with the ends passing down along the tumor on each side may be employed.

If the cervix is contracted and the structure is firm, previous dilatation will be necessary, beginning a day or two before the enucleation is attempted. This is accomplished by means of sponge or laminaria tents in a manner to remove all possibility of infection, which is extremely liable when these tents are used in the usual manner, directly in the canal, since it seems impossible to render them perfectly aseptic. The laminaria are not so good as the sponge tents, because of their limited expansion, but they are more easily rendered aseptic. When they are used several are required, and they are inserted alongside of each other until the limit of the capacity of the canal is reached. They expand more slowly than the sponge tents. In order to effect sufficient dilatation with them it is often necessary to insert a second set after the first have served their purpose and have been removed. This necessitates a longer time to secure the required degree of expansion of the canal.

The sponge tent used in the manner described below is effective, prompt, and absolutely incapable of producing infection. Some preliminary dilatation of the canal with the two or four branch dilator may be necessary in some instances to permit the introduction of a tent of sufficient size, if the required expansion is to be accomplished with one tent, for which an anaesthetic should be employed, otherwise it will not be needed. (See Figs. 26, 27, 28.)

The canal and cavity are first irrigated thoroughly with an antiseptic solution, then as large a sponge tent as it is possible for the canal to accommodate is selected, and this is wrapped around with a strip of moist iodoform gauze in the manner of a bandage, beginning at the point and terminating at the base, the end of the gauze being allowed to project beyond. The tent thus wrapped is placed within a sterile rubber cover similar to a small finger stall. The whole is then inserted into the canal by means of a pair of

dressing forceps. The end of the gauze is drawn down into the vagina, so that it will come into contact with gauze packed into the vagina to retain the tent in the canal. The gauze in the vagina is then thoroughly saturated with sterile water, and care is taken to keep it saturated. In this manner the canal is protected from contact with the tent and the moisture necessary for its expansion is furnished by capillary action through the gauze surrounding it. When the tent used is large it may be tunneled and a strip of gauze passed up through the center as well.

When either sponge or laminaria tents are used the patient must be confined to bed while they are in the cervix, and if severe pain is complained of it should be quieted by morphia administered hypodermically. The application of heat to the hypogastrium, or to the rectum by means of enemata of plain water (not more than a pint), as hot as it can be borne, will frequently afford relief, and should always be tried before morphia is resorted to.

The tent is inserted twenty-four hours before the time fixed for the operation, and by that time the cervix will be dilated sufficiently, and will be very considerably softened.

Technique of Enucleation and Delivery of the Tumor.— When it can be ascertained that the tumor is attached by a distinct pedicle, as can be done by passing the finger into the cavity and sweeping it around the tumor, or, when this is not possible, by using a sound in the same manner, it is seized by its most dependent portion, with a stout volsella, and the wire loop of an ecraseur is slipped over it, as shown in Fig. 121.

This may be accomplished by means of the long handle curved dressing forceps, or a crutch designed especially for this purpose, the same that is used for passing the tape loop for traction. When the loop has passed the largest diameter of the tumor it is shortened by means of the screw at the handle of the instrument, and at the same time the instrument is pushed further up into the cavity between the tumor and the uterine wall, to aid in adjusting the loop around the pedicle. Traction upon the tumor tends to in-

vert that portion of the uterine wall to which the pedicle is attached, hence the pedicle should be severed rather nearer to the tumor than to the uterine wall, and the loop of the ecraseur should not be passed too far up on the pedicle.

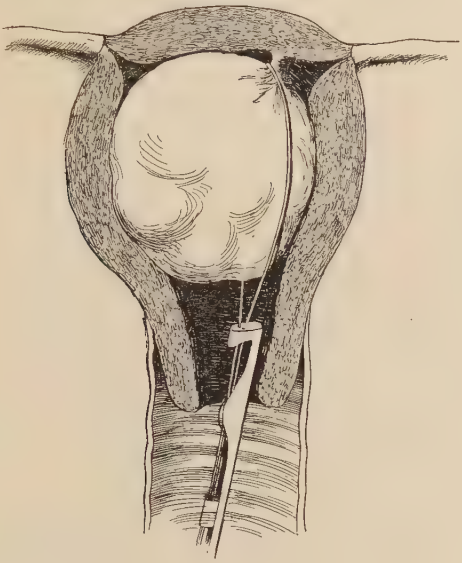


Fig. 121. Showing application of the écraseur for removal of submucous fibroids.

Where the pedicle is short it would be an easy thing to tear away part of the uterine wall, and even open into the peritoneal cavity.

When the loop has been adjusted in proper position it is shortened and tightened around the pedicle by means of the screw at the handle, and finally cuts completely through, severing it and detaching the tumor, which is then dragged through the cervix by traction upon the volsella or traction tapes. If the tumor is too large to be delivered readily, it may be divided into two or four parts by means of stout straight scissors.

The bleeding is usually insignificant, and is readily controlled by irrigating the cavity with a solution of iodine

(one ounce of the compound tincture to the pint of hot water). If this is not successful the cavity may be packed firmly with iodoform gauze, which is removed after forty-eight hours. Unless it is necessary to control bleeding the cavity is not packed after the removal of these tumors, but is left free, and subsequent irrigation with sterilized water or antiseptic solution is resorted to only in case it is demanded by evidence of decomposition. The cavity should be gone over with the dull curette after removal of the tumor, and subsequent irrigation is done if required.

If the pedicle is long and is readily reached it may be grasped with a long, curved broad ligament clamp forceps, and severed to the outer side by scissors or scalpel. One or two catgut sutures may then be introduced to approximate the edges of the stump and control bleeding. Or the pedicle may be transfixed by a stout silk ligature which is tied in the usual manner—on each side and once around the whole—then it is severed to the outer side of the ligature. The knot-tyer shown in use (Fig. 123) is employed for tightening the knot when it is beyond the reach of the fingers.

When the pedicle is thick it may be grasped at about the middle with stout, long-handled pressure forceps, on each side, passed up along the finger as a guide, if necessary, or it is transfixed by a double ligature, which is tied to prevent retraction, then it is divided so as to form flaps on opposite sides. After removing the tumor these flaps are united by three or four interrupted sutures of catgut, and the forceps or traction ligatures are removed and the stump is permitted to retract into the uterine cavity.

Another very good way of dividing a stout pedicle is to make a circular incision through the mucous membrane at the point of attachment of the pedicle with the tumor, or even on the surface of the tumor. The mucous membrane is then stripped back, and a suture is passed through each flap of mucous membrane on each side of the unsevered pedicle in such a manner as to unite these flaps after the pedicle is severed. The ends are left long and a double

turn is made in each suture ready for tying. The pedicle is then divided, the tumor removed, and the sutures tied quickly.

These last two methods are only applicable when the pedicle can be reached, and frequently it cannot be reached until the tumor has been delivered through the cervix, in which case, if the pedicle is short, the uterus would be in-

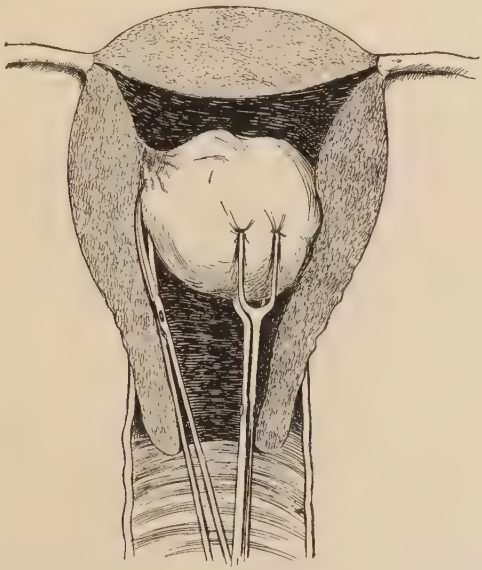


Fig. 122. Showing method of dividing broad lateral attachments of submucous fibroids by means of scissors.

verted. When the tumor is large the obstetric forceps may be utilized for delivering it, applying them in the same manner as to the child's head. Pressure upon the abdomen from above will facilitate delivery.

If the tumor is attached to the lateral wall by a short, thick pedicle, or the attachment is broad, particularly if the tumor is large and the uterine wall is thin, its detachment is more safely accomplished by means of curved scissors, with the concave face turned inward and cutting close

to the tumor (see Fig. 122). It is not always safe to employ an ecraseur for removing such tumors, as traction upon them is very apt to draw the uterine wall inward, and this may be divided and the peritoneal cavity opened by the wire loop of the ecraseur.

Sometimes these tumors are adherent on all sides where the mucous membrane of the uterine wall and that covering the tumor came into contact, the adhesion being due to inflammatory action of fibrinous exudation, and the exact point of attachment of the tumor cannot be determined until this adhesion of the tumor to the walls of the uterine cavity has been separated. This may be accomplished by means of the finger, sweeping it around the tumor on all sides where it can be reached, or with the aid of a stout sound, or a pair of long-handled, blunt, curved scissors closed.

Bleeding from the surface of attachment may be controlled by application of pure tincture of iodine by means of a cotton swab, or by packing the cavity firmly with iodoform gauze. If both fail, the surface may be touched with Monsel's solution, either pure or diluted one in four. The bleeding is usually moderate, and ceases as soon as the uterus contracts, hence the administration of ergot is appropriate in conjunction with local applications of iodine, etc., to stimulate contraction. Subsequent irrigation of the cavity will be necessary only if there is any discharge requiring it.

Sessile submucous fibroids are best removed by splitting the capsule or covering in a longitudinal direction to the uterus and enucleating them by means of the finger and handle of the scalpel, or blunt curved scissors closed, at the same time seizing the tumor within the capsule with the volsella and making traction upon it.

Usually there is little or no bleeding following the removal of these sessile submucous growths. Therefore, the cavity remaining is washed out with salt solution, together with the interior of the uterus, and it is left open for drainage.

When the growth encroaches upon the canal of the cervix and obliterates the cavity so as to obscure its base of attachment, it may be removed piecemeal. The most dependent portion is seized with forceps or volsella, and a wedge-shaped piece is cut out with scissors, then another piece, and so on until the whole has been removed, or so much that the remainder may be shelled out. The walls will collapse when the whole has been removed and the uterus contracts, hence it is treated subsequently as described in the preceding paragraph.

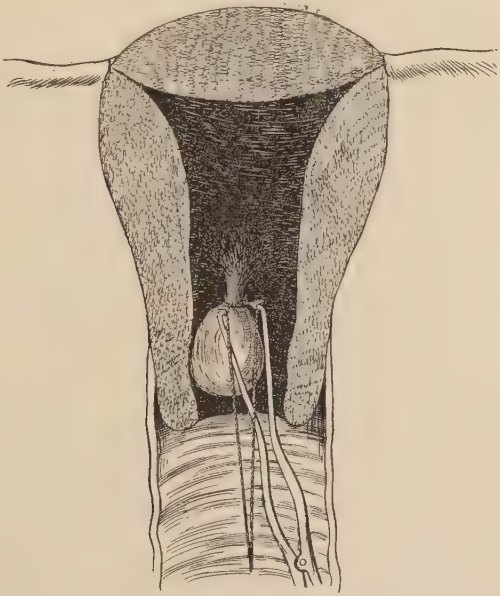


FIG. 123. Showing method of ligating a thin pedicle and application of the knot-tyer for tightening the ligature.

Sloughing fibroids are not easily removed because they are friable, and instruments applied for traction upon them pull off or tear out, and it is often difficult to effect their complete removal. It will sometimes be impossible to extract them until they are fairly detached. Meantime ab-

sorption from the uterine cavity may cause profound general sepsis, to avert or retard which peroxide of hydrogen may be injected into the cavity alongside the mass in every direction. This stimulates vigorous contraction of the organ also and aids expulsion. When the main portion of the tumor has been removed, small pieces sometimes remain undetached even after the cavity has been gone over most thoroughly. Subsequent daily irrigation with peroxide of hydrogen will render them comparatively harmless, and cause their expulsion. The cervix must meanwhile be kept patent for drainage. Irrigation must be continued as long as the discharge is purulent.

Polypi are vascular out-growths from the uterine mucosa and are most always pediculated. They vary greatly in size, and are found attached either at the cornua, near the entrance of the tubes, or at the internal os, and projecting into the canal of the cervix. When they are small and the pedicle is thin, they may be seized with forceps and twisted off. When they are larger and are accessible the pedicle may be ligated with strong catgut and divided with scissors. The knot-tyer may be employed for tightening the knot. (See Fig. 123.)

The after-management of these cases is very simple. The patient is confined to bed for a week only after removal of pediculated tumors, and after removal of large sessile growth from ten days to two weeks' confinement will suffice. Subsequent irrigation of the uterine cavity is only necessary when there is a purulent discharge or when detached fragments or ligatures are being thrown off from the surface of the stump. Then daily irrigations of one per cent. solution of lysol or solution of peroxide of hydrogen, one to three or four parts of water, are employed. When gauze is packed into the cavity to control hemorrhage it should not be permitted to remain longer than forty-eight hours, and upon removing it the cavity should be thoroughly irrigated with lysol solution. It will not be necessary to reapply the gauze, since the uterus will have contracted when it is removed and the vessels are closed.

CHAPTER XXV.

ABDOMINAL HYSTERECTOMY.

The removal of the uterus entire or in part by amputation at the junction of the body with the cervix is commonly designated hysterectomy. Strictly speaking, however, hysterectomy signifies removal of the entire uterus, and when the cervix is left it is a supra-vaginal amputation, sometimes designated supra-vaginal hysterectomy. When a supra-vaginal hysterectomy is done for removal of fibroid uterus it is very properly called hystero-myomectomy.

The technique of these operations is similar up to a certain point; therefore, they are described here under the general head of hysterectomy, but they will be detailed under correct subheadings. Removal of the entire broad ligaments with the uterus for extensive carcinomatous involvement of the former will, however, be described separately.

Complete hysterectomy (or pan-hysterectomy) and supra-vaginal hysterectomy, respectively, are considered justifiable procedures under the following conditions, viz.:

(*a*) For carcinoma or sarcoma of the uterus, when the whole organ, including the cervix, should be removed, together with the broad ligaments if they are involved.

(*b*) For septic processes involving the walls of the organ, when it should be removed entire, unless the disease is confined to a portion of the body of the uterus, and the cervix is not involved and is in a healthy condition, in which case it may be left, a supra-vaginal amputation being made.

(*c*) When the uterus is the seat of fibroid growths involving too much of its structure to make a satisfactory myomectomy possible. Then amputation at the junction of the cervix is permissible if the cervix is not involved by the growth and is otherwise healthy.

(*d*) When degeneration of a fibroid growth has occurred and includes the uterine structure. Hystero-myomectomy is usually feasible in these cases.

(*e*) For suppurating submucous myoma when it cannot be removed satisfactorily by the vagina. Hystero-myomectomy is usually practicable in these cases also.

(*f*) When the myomatous uterus develops in the pelvis, filling it, from which it cannot be extricated until the broad ligaments have been divided; under this condition a myomectomy is impracticable, and the uterus must be removed at the cervical junction.

When possible it is best to preserve the cervix because it affords support to the other pelvic organs, strengthens the pelvic roof, prevents the occurrence of hernia, and obviates contraction and shortening of the vagina. On the other hand, if the uterine wall is the seat of carcinoma or sarcoma, or the endometrium alone is involved, even if the cervix shows no evidence of disease it should be removed with the remainder of the organ. Likewise, if the cervix is not in a perfectly healthy condition with any of the above named conditions, requiring removal of the body, it should be removed with it to obviate the necessity subsequently.

General Preparation of the Patient.—The preliminary preparation of the patient should be as thorough as possible, consistent with the urgency for the operation. If the patient is exhausted by persistent, uncontrollable hemorrhage or a septic process, not more than a day or two, or a few days at most, may be spared for preparing her for operation, and the best that can be done in that time is to clear out the intestinal tract, make the kidneys act freely, and stimulate the activity of the skin. A dose of calomel followed by a saline cathartic and warm saline enemata will fulfill the first two requirements, and a tepid sponge bath of one part alcohol to three parts water, twice a day, followed by brisk rubbing with a Turkish towel, will stimulate the activity of the skin.

At the same time the patient's strength should be supported by giving concentrated liquid nourishment every

three or four hours, to which stimulants may be added when required. Rare lean beef is not an objectionable addition, since when it is well masticated or thoroughly divided beforehand, it is readily digested and leaves little or no residue in the bowels.

If there is much intestinal distention, the fermentation to which it is due may be counteracted by flushing the colon with warm water, made alkaline by the addition of bicarbonate of soda, and by administering copious draughts of hot water with 20 or 30 grains of the soda added, twice or three times a day, when the stomach is empty, withholding food of any kind for at least an hour after.

When immediate operation is not demanded, at least two or three weeks should be devoted to preparation, during which time the liver, kidneys, intestinal tract and skin must be brought as nearly as possible to a condition of normal functional activity, for the details of which and the special dietary necessary see chapter on "Preparation of Patients for Abdominal Operation." The advantage of prolonged preparation for an operation of such gravity is self-evident.

The immediate preparation should include cleansing and disinfecting the vulva and vagina, as well as the surface of the abdomen, in the manner already described in connection with vaginal section. Disinfection of the vagina is particularly important in preparing for hysterectomy, since it would be opened into from above if the whole uterus is removed.

After the patient has been placed on the operating table, the cervix should be dilated and the canal and as much of the cavity as can be reached should be curetted and irrigated freely with an antiseptic solution. This can be done by one of the assistants, who would have ample time to resterilize his hands while the patient is being rearranged for the operation. It is best not to pack gauze into the canal unless the whole uterus is to be removed, since it causes retention of the secretion which would escape and soil the field of operation when the cervix is divided. If the whole

uterus is to be removed plugging the canal with gauze serves a useful purpose.

It has been suggested to introduce into the vagina a cup pessary on a handle, as represented in Fig. 124, by which at the proper time the uterus may be elevated in the pelvis and brought within easy reach from above. The presence of this support in the vagina furnishes a guide to the loca-

Fig. 124. Showing the application of the support in the vagina for elevating the uterus in the pelvis.

tion of the cervix and cervico-vaginal fold, which is important when the vagina is to be opened for removing the cervix with the uterus.

Instruments Required.—Two scalpels; two pair thumb forceps, short; one dozen hemostatic forceps; half a dozen of broad ligament clamps; one strong volsella forceps; one pair stout, long handled, straight scissors with round points; one pair strong long handled scissors, curved on the flat, with round points; one pair long handled thumb

forceps; one long handled needle holder; two pairs sponge holder forceps; two special aneurism needles to serve as ligature carriers.

In addition there will be required curved needles, large and small, strong ligature silk, catgut, plain and chromicized, and twelve flat gauze pads, six large and six small, and two dozen sterile towels.*

Technique of Hystero-Myomectomy.—The abdomen is opened in the median line by an incision extending at first from just below the umbilicus to within an inch and a half of the pubis, if the tumor to be removed is large. If a larger opening is required the incision is extended after the peritoneal cavity has been opened, according to directions given in the section on "Making and Closing the Cœliotomy Incision." In some instances where the uterus is small a much shorter incision will suffice. The peritoneum is divided carefully near the upper angle of the incision to avoid wounding the bladder, which is often found spread out over the anterior face of a fibroid uterus, extending sometimes nearly to the level of the umbilicus. Exploration of the bladder with the sound, or defining its limits by filling it with warm sterilized water before opening the abdomen, is a very wise precaution. The incision in the peritoneum is first made large enough to permit the introduction of two fingers, and is then extended to the limit above and below, along them as a guide, by means of a pair of long handled round-pointed scissors.

The limit of the incision of the peritoneum downward will depend upon the position of the bladder. If it is displaced upward, the anterior vesical fold will be situated some distance above the pubis, and it would not be possible to divide the peritoneum down to the limit of the incision through the outer layers of the abdominal wall.

As soon as the peritoneum is divided temporary sutures are inserted on each side, the ends being left long and tied together to serve as traction ligatures. These sutures are

*For arrangement of operating room and position of operator and assistants, see chapter on Making and Closing the Cœliotomy Incision.

introduced so as to include the skin and peritoneum only, and when tied bring these layers of the abdominal wall together, covering up the muscular layer and fat, which are thus protected from bruising and handling during the subsequent steps of the operation. Several of these sutures

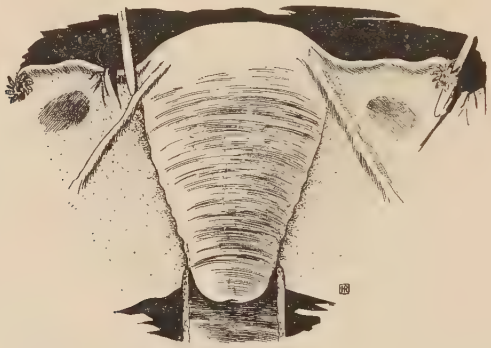


FIG. 125. Showing application of ligature and clamp, on the right of the drawing (left of patient), to the ovarian artery when the ovary is to be removed with the uterus. And on the left of the drawing showing the application of the ligature and clamp to the ovarian artery and tube when the ovary is to be preserved The cut shows also on both sides the division of the top of the broad ligament between the ligature and clamp.

are inserted on each side and one at the lower angle of the wound in the center, to avoid separation of the peritoneum from the abdominal wall, which often occurs when this suture is not employed. The material for these sutures may be either silk or stout linen thread that has been sterilized. Protection of the margins of the incision in this manner favors primary union of the wound afterwards. These sutures are removed, of course, before the abdominal incision is closed.

The hand is now introduced into the abdomen and swept around the tumor, separating any adhesions encountered except those between the intestines and the tumor. These must be divided carefully under inspection, drawing them up into view for this purpose. It is frequently possible to separate them with the fingers by grasping the gut on the

opposite side to the point of attachment and drawing upon it, at the same time employing the fingers of the other hand at the point of attachment to sever it. When, however, the band of attachment is very firm and does not yield to such manipulation, it is divided by careful dissection with the knife or scissors, taking care to keep away from the wall of the gut, encroaching rather upon the tumor or uterus, as the case may be, if necessary. Traction upon the gut, as

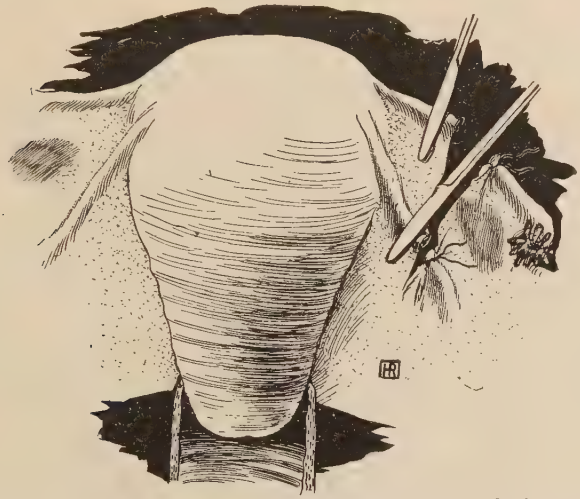


FIG. 126. Showing the application of the ligatures and clamps to the ovarian artery and round ligament of one side and the broad ligament divided.

described above, which puts the band of adhesion on the stretch, is kept up throughout this dissection.

If the gut wall is accidentally penetrated it should be immediately closed by Lembert sutures of fine silk, placed near enough together to make the closure complete.

Adhesions of the omentum to the tumor or uterus often contain large vessels, and must be dealt with differently. It is useless waste of time to attempt separation of a firmly adherent fringe of omentum; therefore, after separating that portion which is easily detached by means of the finger, the remainder is ligated with strong catgut, either *en*

masse or in sections, depending upon the extent of the attachment and the size of the vessels it contains, and then divided between the ligature and tumor. These vessels sometimes furnish the tumor with a very considerable part of its nourishment.

The adhesions having been separated, the tumor, if large, may be lifted with the uterus out of the abdomen, and the subsequent steps of the operation are thus greatly facilitated. A strong volsella forceps or a cork-screw is used for this purpose, being fastened in the fundus or upper part of the tumor. In these cases it will not usually be necessary to employ the Trendelenburg posture, but if the uterus or tumor is small this position will permit the intestines to gravitate from the field of operation. They are then securely walled off by broad gauze pads, which are inserted between them and the uterus down to the bottom of the pelvis. This leaves the pelvis free and prevents injury of the intestines during subsequent manipulations. If the intestines are held back properly by the assistant they are never exposed throughout the operation. Upon its completion, after the pelvic roof has been closed, they are restored to their normal position and the omentum is spread out carefully over them, preventing contact with the line of incision.

There are three principal vessels on each side of the uterus, constituting its blood supply, that will be divided in the course of the operation, the ovarian, the small artery accompanying the round ligament, which is a branch from the deep epigastric, and the uterine artery. These must be secured by ligature or clamp and ligated subsequently before the uterus can be removed. Other points from which the bleeding is usually insignificant, if the main vessels have been properly secured, may be disregarded until the uterus with tumor has been gotten out of the way. Then they are picked up with pressure forceps and ligated with catgut.

In this location, on account of the anastomosis of the uterine and ovarian arteries, these vessels bleed from both ends, and must either be ligated in two places and divided

between the ligatures, or ligated to the outer side and clamped with pressure forceps to the inner side of the point where the vessel is divided. This rule holds when the vessels are divided on both sides before the amputation is made, except that after having secured the uterine artery on one side by ligature it is not necessary to apply more than one ligature to the uterine artery on the other side, and that must be placed to the outer side of the point where it is to be divided.

If the ovary on one or both sides is to be removed with the uterus, the ovarian artery is ligated with the infundibulo-pelvic ligament, to the outer side of the extremity of the tube. If the ovary is to be left the ovarian artery is to be ligated with the tube near the uterus, to the inner side of the ovary. (See Fig. 125.)

For ligating these vessels some operators employ stout catgut, sometimes using it double, but I prefer strong silk, feeling that it is always more reliable, and have never had reason to regret it, never having had a case of secondary hemorrhage. It can be more certainly relied upon not to break in the tying, if it has been tested beforehand, and the knot once tied firmly will never loosen. On the other hand, catgut that will stand test beforehand becomes weakened when wet, often breaking in the tying. It is possible also that the knot may become loosened when the gut swells from absorption of moisture from the surrounding tissue.

The chromicized catgut and that prepared in cumol are not, however, objectionable on this score. Yet the ordinary methods of preparing catgut are not always reliable. Silk, however, may be rendered absolutely sterile by boiling in water, and if it is immersed in sterile alcohol afterwards and preserved in it until used it is perfectly reliable.

There are two methods of ligating and dividing the vessels of the broad ligaments supplying the uterus. One is to ligate and divide the vessels on both sides, before amputating the uterus, beginning with the ovarian on the left, then the round ligament, and next the uterine artery (Fig. 127). Then on the other side the vessels are ligated in the

same order, and after all have been secured the uterus is amputated at the level of the internal os. The other method, practiced by Howard Kelley, and known by his name, consists in ligating and dividing the vessels on the left, then amputating the uterus, then clamping the right uterine artery and dividing it between the clamp and the uterus, then clamping the right round ligament, dividing it to the inner side of the clamp, and finally clamping the right ovarian artery and dividing it to the inner side of the clamp. This method, which will be described in detail further on, possesses many advantages over the other method in conditions suitable for its execution.

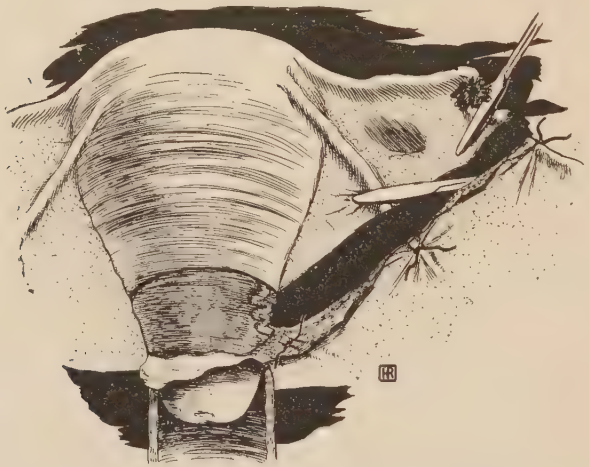


Fig. 127. Showing ligatures and clamps applied to the ovarian artery and round ligament of one side and the broad ligament divided down to the side of the uterus, the peritoneum on the anterior face of the uterus divided and the bladder stripped off, exposing the base of the broad ligament and uterine artery. The drawing shows also the ligature applied to the uterine artery which is divided, and the uterine end is shown not clamped, this being unnecessary when the artery is ligated on both sides before the uterus is amputated

The adhesions having been separated and the ovaries and tubes on each side examined, to determine the advisability of retaining them, we are ready to proceed with the operation. If both ovaries are to be removed, the ligature for

securing the ovarian artery on each side is applied to the outer side of the extremity of the tube. (See Fig. 125.) Grasping the broad ligament with the left hand, with the fingers behind it and the thumb in front, the thin space below the vessel is exposed and rendered tense by pressure from behind, with the fore-finger, and the ligature is passed through at this point from in front, being guided by the finger. A special aneurism needle is generally used for this purpose, though a curved needle with carrying thread may be employed, the needle being held in the grasp of a long handled needle forceps. This ligature is now tied firmly and the ends are cut short to get them out of the way. A clamp is then applied, including the same structures as the ligature, between it and the ovary, and the intervening tissue is divided with scissors. (See Fig. 125.) The fingers are now moved further down on the broad ligament and nearer to the side of the uterus, so as to get under and to the inner side of the round ligament. A second ligature is then passed under the round ligament in the same direction as the first, being guided by the fore-finger on the posterior face of the broad ligament. This ligature is tied so as to include with the round ligament that portion of the broad ligament above it that was not divided, and the ends are cut short. A clamp is then applied to the inner side of this ligature, between it and the side of the uterus. (See Fig. 126.)

If the ovary is to be preserved, the only difference in the technique consists in grasping the broad ligament between it and the side of the uterus, locating the thin space well below the tube, and applying the first ligature and clamp there and dividing the intervening tissue, as shown in Figs. 125 and 126. The round ligament in this case is ligated and divided at a point nearer the uterus than where the ovary is removed.

The ovarian artery and round ligament on the right are now ligated and clamped, and the broad ligament divided in the same manner to the side of the uterus.

If the vessels have been secured properly there will be

no bleeding of consequence from the divided edges of the broad ligament, but any freely bleeding points that are detected must be picked up with pressure clamps, and ligated with catgut before proceeding further.

With a scalpel the peritoneum covering the anterior face of the uterus is now divided, just above the attachment of the bladder, from the limit of the divided broad ligament on one side to that on the other side. Grasping a gauze pad in the hand or in a pair of sponge forceps and pressing upon the top of the bladder downward, it is peeled off from the uterus down to the junction of the uterus with the cervix. (See Fig. 127.) The uterus is now drawn forward, exposing the posterior face, and the peritoneal layer is divided at the same level as in front, from one broad ligament to the other. The peritoneum below this incision is stripped down likewise to the same distance as in front. In this manner the base of the broad ligament with the uterine artery on each side is exposed.

The uterus is drawn well over to the right, which puts the base of the left broad ligament on the stretch. This is now grasped between the thumb and forefinger, and the pulsation of the uterine artery may be distinctly felt. A stout silk ligature is passed under the artery, close to the side of the uterus (to avoid the ureter, which is only half an inch away), using for the purpose either the aneurism needle or a curved needle, in a needle holder, with carrying thread. This ligature is tied firmly and the ends are left long. (See Fig. 127.)

The uterus is then drawn well over to the left and the right uterine artery is exposed and ligated in the same manner as on the left, close to the side of the uterus. It will not be necessary to apply clamps to these vessels on the uterine side of the ligature or point where they are to be divided, since the application of the ligatures to the uterine arteries cuts off completely the remaining blood supply to the uterus, and we may proceed to amputate it without apprehending hemorrhage.

The uterus is amputated either with stout, long-handled

curved scissors or with the scalpel, making an anterior and posterior flaps from above downward, and leaving a depression in the stump of the cervix remaining.

Hystero-Myomectomy by Howard Kelley's Method.— The broad ligament on the left is grasped between the fingers of the left hand behind it and the thumb in front, and the clear space below the tube and ovarian vessels is located, through which the first ligature is passed. If the ovary and tube are to be removed, this first ligature is passed to the outer side of the extremity of the tube, and if they are to be preserved, then it is passed between the ovary and side of the uterus. This ligature is of fine silk (No. 2), and is passed by means of a curved needle with carrying thread in the grasp of a pair of needle forceps. It is tied tightly over the roof of the broad ligament, and a clamp is applied to the same structure included by the ligature, a short distance to the inner side, between it and the uterus, and the intervening broad ligament is divided with scissors. (See Fig. 125.) The ends of this ligature are cut short.

The round ligament is now lifted up, and the second ligature of the same size silk is passed in the same manner under and around it nearer the side of the uterus. This is tied firmly, a clamp is applied between the ligature and the uterus, and the intervening broad ligament is divided with scissors down to the side of the uterus. Slight bleeding along the course of this incision through the broad ligament may be disregarded until the uterus has been gotten out of the way, but if it is free, a clamp should be applied to the bleeding point before proceeding further. The broad ligament is divided from its roof to the side of the uterus by these incisions. (See Fig. 127 and Fig. 128.)

The uterus is now drawn backwards and the peritoneum on its anterior face, just above the attachment of the bladder, is incised in a curved line across from one broad ligament to the other. The location of this incision will, of course, depend upon the seat of attachment of the bladder to the uterine wall. Sometimes it will be found attached

far up and sometimes lower down on the face of the uterus. The uterus is now pulled up, while, with a gauze pad in the grasp of sponge holder forceps pressed firmly against the uterus below the line of incision in the peritoneum, the bladder is stripped down on all sides until the cervix of the uterus is exposed below the level of the internal os. This exposes the base of the broad ligament on the left, and the uterine artery and veins may be seen, or the pulsation of the artery may be felt by grasping the base of the ligament. These vessels are ligated close to the side of the uterus by a silk ligature of larger size than was used for the ovarian vessels (No. 3 or 4), being passed around them by means of a curved needle with carrying thread in the grasp of a long handle needle forceps. This ligature should not include any of the uterine structure.

The uterus is now drawn over to the right, and an assistant stands ready with pressure forceps to grasp the uterine ends of these vessels when divided, as the operator divides the cervix. This he does with a spud or stout curved scissors or scalpel, beginning on the left and extending the incision across to the right, the uterus being dragged all the while more and more over to the right, which puts the structure to be divided constantly upon the stretch. As soon as the cervical canal is cut across, the assistant places a gauze pad under the upper cut surface to prevent the escape of secretion upon the field of operation. The incision is extended across to the right, somewhat cautiously as the limit of the opposite side of the cervix is approached, and upward rather than straight across, so as to expose the right uterine artery above the point where it joins the side of the uterus. When the last fibres of the cervical structure are divided, the right uterine artery is exposed, but it is clamped preferably above this point, so as to avoid including the ureter in the clamp, the points of which should not be pushed too far down into the tissues. The position of this clamp is seen in Fig. 128.

The right uterine artery is now divided above the clamp

(See Fig. 128), and if the subsequent division of the broad ligament from below upward is rapidly executed, there will be no need of applying clamps to the uterine ends of the divided vessels. The incision is extended rapidly up along the side of the uterus until the round ligament is reached, which is then clamped, and the incision extended on up between the clamp and the uterus. Next the ovarian vessels with the tube are clamped, and the remainder of

FIG. 128. Showing vessels of left broad ligament tied, their uterine ends clamped, the broad ligament divided, the uterus amputated from the cervix, the right uterine artery clamped and divided and the other vessels of the right broad ligament clamped, the ligament being divided between the clamp and side of the uterus up to the right tube.

the broad ligament between this clamp and the uterus is divided and the uterus is lifted out. (See Fig. 128.)

Thus the vessels on the left are all secured by ligatures and those on the right by clamps, and the uterus is gotten out of the way quickly, leaving a clear field for securing minor bleeding points. The field is immediately inspected, the cervical stump caught with bullet forceps, being drawn up, and the surface cleared of clots to facilitate the detection of bleeding points. These are caught with pressure forceps and ligated with fine catgut. The use of an electric head-light will greatly aid this search.

Next the vessels on the right secured by clamps are tied with silk, as on the other side, and the clamps removed. The round ligament is drawn up first and a ligature passed around it to the outer side of the clamp and tied. Then the right ovarian vessels are ligated to the outer side of the clamp in the same manner as on the left, the ligature being passed through the clear space below

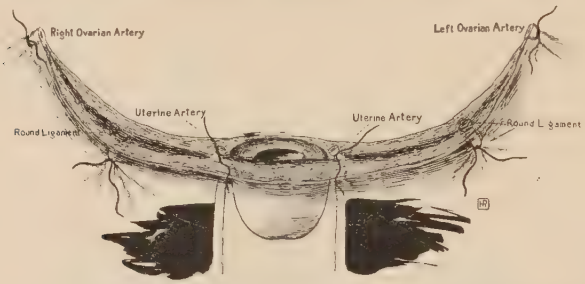


Fig. 129. Showing the stump of the cervix and both broad ligaments with vessels ligated, after the uterus has been removed.

the tube and tied over the roof of the broad ligament. The uterine artery is then drawn up and ligated below the clamp, but at a point above the cervical stump to avoid including the ureter. The tissue compressed by these clamps is trimmed off after the vessels have been ligated and they have been removed.

If it is thought advisable to remove the right tube and ovary, this can be done better after the uterus has been gotten out of the way. Then the ligature applied to the ovarian vessels is introduced to the outer side of the extremity of the tube, instead of near the clamp as described above.

Some operators prefer to apply clamps to both ends of the vessels on the left, instead of ligatures, and after the uterus is gotten out, each clamp is detached in turn, and the end of the vessel it secures is picked up with pressure forceps and tied separately, without including a mass of tissue with it.

Suturing the Stump of the Cervix and Closing the Peritoneum over it.—Unless the cervical canal is unusually patulous, or has been dilated before opening the abdomen, it should be dilated now by inserting a steel dilator into it from above. To facilitate drainage of subsequent oozing a strip of iodoform gauze is passed down through the canal into the vagina, and the upper end of the gauze is folded across the cervical stump, which is then closed over it by sutures. These sutures of stout catgut are inserted in an anteroposterior direction, and include the whole

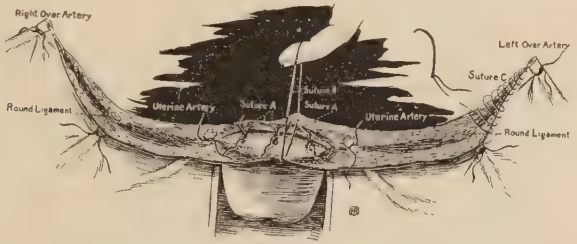


FIG. 130. Showing the method of suturing the stump of the cervix, and drawing the peritoneal flaps over it, and also the method of uniting the margins of the broad ligaments by continuous suture which begins at the stump of the ligated vessels on the left and terminates at the stump of the ligated ovarian vessels on the right.

thickness of the stump wall, except the mucous membrane of the canal. Care should be taken not to catch the gauze in the loops of these sutures. The central suture is introduced first, and when it has been tied, the ends are left temporarily long to serve as a traction ligature to take the place of the bullet forceps, which are then removed. One or two sutures through the stump on each side of this central suture will approximate it completely. (See Fig. 130.)

The anterior and posterior peritoneal folds are not included in these sutures, but are next drawn together over the stump at the center by a central temporary suture (Fig. 130), which serves as a guide for accurate approximation of the peritoneal margins of the divided broad ligament from the ligated ovarian vessels on one side of the pelvis to that on the other.

Uniting the Peritoneal Margins of the Divided Broad Ligament and Covering over the Stump of the Cervix with the Reflected Peritoneal Flaps from the Uterus.—The stump of the left ovarian vessels is caught with pressure forceps to lift up the remains of the broad ligament, and with a curved needle, threaded with fine catgut of sufficient length to reach from one side of the pelvis to the other by continuous suture, both margins of the peritoneum at the extreme limit of the incision are transfixed and the suture drawn through and tied. The free end of the suture is now caught with the pressure forceps, which is removed from the stump of the ovarian vessels. This stump is turned in and covered by peritoneum with the next loop of the continuous suture, which, from here on, is inserted so that, when tightened, the edges of the peritoneum are turned in. This is accomplished by inserting the needle and bringing it out upon the peritoneal surface a short distance from each margin, after the manner of the Lembert suture. When the stump of the round ligament is reached this is turned in also.

This suture is continued in this manner down to the central suture (Fig. 130 b), covering over the stump of the left uterine artery, the base of the broad ligament, and the left half of the cervical stump. It is then continued from this point in a similar manner up the right side to the stump of the right ovarian vessels and extreme limit of the incision on that side of the pelvis, covering the right half of the cervical stump, the right uterine vessels, and the base of the broad ligament, turning in the stump of the right round ligament and the ovarian vessels as on the opposite side of the pelvis.

The pelvic cavity is cleansed by flushing it with normal salt solution, warm, and sponging it out until the solution is clear. It may then be left dry or filled with normal salt solution, which is left in, and which is subsequently absorbed.

Extirpation of the Whole Uterus, Including the Cervix.—The steps of the operation when the whole uterus is to

be removed are the same up to the point where both uterine arteries have been ligated, and have already been described. It will be unnecessary to apply clamps or ligatures to the uterine arteries, to the inner or uterine side of the point where they are divided, in extending the incision through into the vagina. One ligature on each artery to the outer side of this point shuts off the blood supply completely when the ovarian vessels and round ligaments on each side have been tied. When, therefore, the uterine artery on each side has been tied enucleation

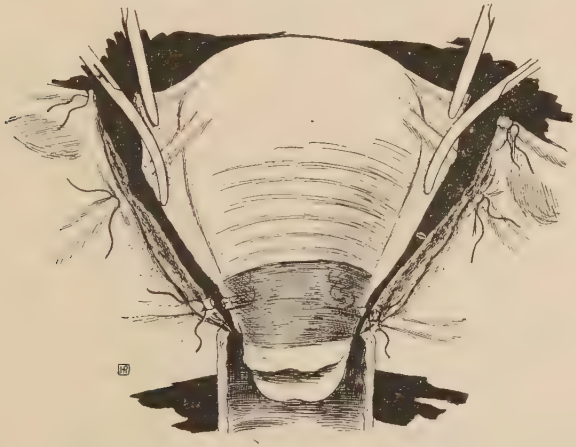


FIG. 131. Showing the vessels of the broad ligaments ligated, the tube and round ligament on each side clamped near the uterus and both broad ligaments divided, and the incision extending through into the vagina at the cervico-vaginal junction in enucleation of the whole uterus with cervix.

of the cervix may be proceeded with without fear of serious hemorrhage. Bleeding from smaller vessels in the vaginal wall may be arrested by clamps and ligature, but this will usually be controlled by the suture applied to close the vaginal roof.

After both uterine arteries have been tied, the peritoneal flap on the anterior and posterior surface of the uterus is peeled down to the level of the junction of the vagina with the cervix. The cup support against the cervix in

the vagina shown in Fig 124 will prove very serviceable in locating the cervicovaginal junction. When this point is reached the uterus is drawn up and forward, and with curved scissors the vagina is opened posterior to the cervix. The posterior severed vaginal margin is now caught with bullet forceps, which places it under control of the operator, and the vagina is rapidly detached from the cervix, close to it all around its circumference, and the uterus is lifted out. (See Fig. 131.) The anterior margin of the vagina is now seized with bullet forceps also. Search is now made for bleeding points which are caught with pressure forceps and ligated when necessary with catgut.

Some operators do not close the vaginal roof, but leave it open for drainage, bringing the ends of the ligatures used for ligating the vessels of the broad ligament, which have been left long, out into the vagina, and folding the peritoneal flaps together over the vaginal opening without suturing them. This is objectionable for many reasons, chief of which is the liability of infection from the vagina along the ligatures.

The course most frequently adopted is to close the opening into the vagina by a purse string suture introduced around its circumference. The suture material used should be either chromicized catgut or catgut prepared in cumol. This suture controls all oozing from the cut vaginal wall and draws it up in the pelvis. This stump is then covered over with the peritoneal flaps in closing the broad ligaments in the same manner as where a stump of the cervix is left. (See Fig. 130.) There will be no necessity for drainage if perfect asepsis has been preserved throughout the operation.

After the completion of any one of these methods the pads employed for keeping back the intestines are removed, the pelvis is wiped dry or flushed with normal salt solution, the intestines are brought down into position, and the omentum is spread out over them. The abdominal incision is then closed in the manner described under the head of "Closing the Coeliotomy Wound."

When everything goes well after these operations the patient should be confined to bed for at least three or four weeks.

When the pelvic roof has been closed the after-management is simple. The gauze is removed from the stump of the cervix at the end of forty-eight hours, and a vaginal douche of sterile water is used. Subsequently irrigation of the vagina will not be necessary. Should suppuration occur above the stump, which is unusual, the pus will find its way through the canal of the cervix. It will be necessary then to introduce a return flow irrigator into the canal as far as it will enter readily, and use freely a solution of peroxide of hydrogen 1 to 4. This should be repeated every day until all evidence of suppuration has disappeared.

CHAPTER XXVI.

VAGINAL HYSTERECTOMY.

Indications.—The uterus may be removed through the vagina for cancer, when the disease is confined to the cervix and endometrium or body of the organ, and there is no appreciable involvement of the broad ligaments. When the disease has extended to the broad ligaments radical enucleation is more certain by the abdominal route.

Likewise in inflammatory complications of the adnexa, where the uterus is to be removed also, and is small enough to be delivered readily through the vagina, vaginal hysterectomy may be substituted for abdominal hysterectomy. But it is better not to attempt vaginal hysterectomy in any case unless the vulva orifice is roomy.

Preparation for Operation.—When immediate operation is not demanded the preparation of the patient should be as thorough as for abdominal hysterectomy, and at least two or three weeks should be consumed, when necessary, in restoring to functional activity the kidneys, liver intestinal tract, and skin, to enable her to withstand the shock of the operation, and to insure a smooth convalescence. (See chapter on "Preparation of Patient for Abdominal Operations.")

If the urgency of the case will not permit prolonged preparation we must be content with two or three days, during which time the intestinal tract must be thoroughly cleared out and the liver, kidneys, and skin must be made as active as possible. (See same chapter referred to above.)

Local Preparation.—The vagina should be irrigated freely once a day for the two or three days immediately preceding the operation, with a one per cent. solution of lysol, and then filled loosely with markasol gauze, which is permitted to remain until the next day.

The evening before the operation the pubis and vulva with anal vicinity are shaved, and afterwards washed thoroughly with green soap and nail brush. After irrigating the vagina, as above, the markasol gauze is placed in the vagina and a pad of the same is placed against the vulva. This vaginal dressing is not removed until the patient is placed on the operating table, and the vulva pad is removed only to permit the urine to be voided, after which it is replaced.

Instruments Required.—1 broad, short-bladed perineal retractor. (The blade must be short to permit the uterus to be drawn down.)

1 long, narrow-bladed retractor for anterior vaginal wall and bladder.

2 short, narrow lateral retractors.

4 special bullet forceps tractors.

½ dozen long, stout, broad ligament clamp forceps, straight and curved.

½ dozen long hemostatic forceps.

1 stout, long handle straight scissors.

1 long handle curved scissors.

2 scalpels.

1 special left curve aneurism needle or ligature carrier.

½ dozen quarter-curved needles.

1 long handle needle forceps.

4 sponge holder forceps, fenestrated blades.

Stout ligature silk.

Stout catgut No. 4, also strong No. 2 catgut prepared in cumol.

Assistants and Nurses.—Beside the anæsthetizer, there should be two assistants and two nurses. The first assistant stands to the left of the patient and to the right of the operator, facing him as he sits facing the end of the table upon which the buttocks of the patient rest. In assisting he bends over between the supported legs of the patient to obtain a view of the field of operation.

The second assistant has charge of the instruments, which he passes to the operator or first assistant as

required. The most convenient position for him, with the table for the instruments, is to the right of the operator. (See diagram.) A competent nurse who understands the work and knows the names of the instruments may take this position.

The first nurse sits to the left of the operator to hold with her right hand the perineal retractor, but far enough away not to interfere with with his movements. In holding the retractor she must bend over and get her forearm well out of the way.

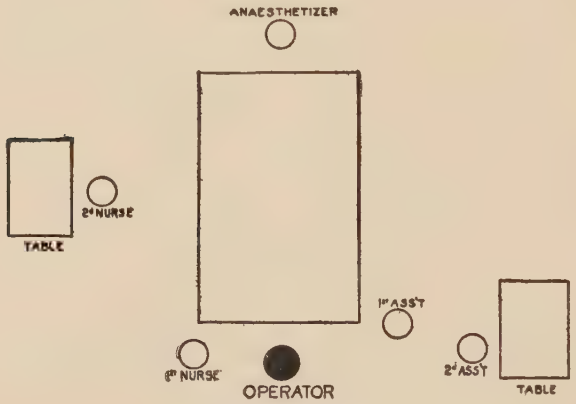


Fig. 132. Diagram.

The second nurse attends to the sponges, solutions, etc., and holds herself ready to lend any extra assistance required. (See diagram of arrangement of tables, etc.)

Technique of the Operation.—The patient is placed on the table with the buttocks well down over the edge, so the handle of the perineal retractor will not come in contact with it. The legs are supported either by lateral upright leg supports attached to the table, or by the leg holder made of canvas, which passes around the neck, with each end fastened by means of a buckle around the upper part of each calf. Both of these leg supports hold the patient in an exaggerated lithotomy position, with the thighs flexed upon the abdomen and well abducted.

The gauze dressing is removed from the vagina, and the vulva and surrounding surface is washed with green soap and nail brush and rinsed off with a one per cent. solution of lysol. The vagina is then washed out thoroughly with green soap and a pledget of cotton or gauze, in the grasp of a long handle dressing forceps, and irrigated freely with the same solution as was used upon the external genitals.

The perineal retractor is inserted and given to the nurse to hold. She must maintain a steady traction throughout. The operator now seizes each lip of the cervix with a bullet forceps, draws the uterus down, and separating the forceps, spreads the lips apart, while he proceeds to cleanse the canal by wiping it out thoroughly with small pledgets of gauze, in the grasp of dressing forceps. After the canal is freed of mucus and secretion, it is irrigated freely with the lysol solution and filled loosely with a narrow strip of iodoform gauze. The bullet forceps are now removed, and both lips are seized with one bullet forceps. When these are closed the lips of the cervix are closed over the gauze in the canal, which is thus practically sealed. In lieu of the forceps one or several traction ligatures may be inserted through both lips of the cervix and tied tightly. The ends of these ligatures are left long and tied together. When the cervical structure is friable these ligatures must be inserted well up beyond the diseased area where the tissue is firm. In such cases the ligatures are to be preferred to the bullet forceps, because they are less liable to tear out.

The cervix is drawn as far down as possible by means of the traction ligature or bullet forceps, and the lateral retractors are inserted to hold back the vaginal wall. If the cervix is diseased or the vaginal portion is denuded of its epithelium the incision is made in the vaginal roof at the cervico-vaginal fold, and extended all around the cervix following this line. The long-handled curved scissors serve best for this purpose. If the cervix is healthy and the mucous membrane covering it is firm, the method

of Segund has some advantage, since there is not so much shortening of the vagina afterwards.

An incision is made with the scalpel from near the lateral angles of the external os on each side, extending up the side of the cervix, and a short distance beyond the cervico-vaginal fold above. These lateral incisions are united by an incision across the anterior face of the cervix just above the margin of the anterior lip, about two lines above the

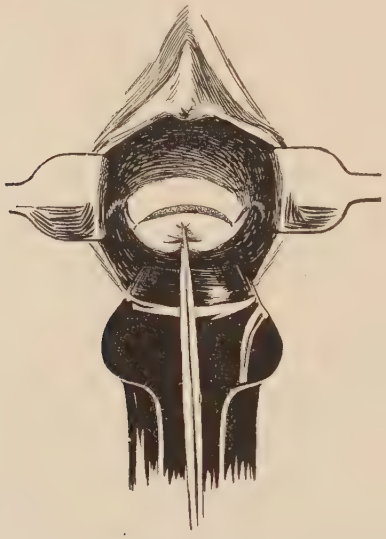


Fig. 133. Showing the lateral and anterior incisions through the mucous membrane covering the cervix as the first step of vaginal hysterectomy.

bite of the bullet forceps or traction ligatures, and another across the posterior lip of the cervix at the same level (Fig. 133). These incisions extend only through the thickness of the mucous membrane into the connective tissue beneath. The cervix is now drawn down firmly and the mucous membrane covering the cervix is peeled up both in front and behind with the thumb nail, denuding the cervix considerably beyond the cervico-vaginal junction and exposing the base of the broad ligament on each

side. (See Fig. 134.) If the connective tissue does not yield readily to this method of dissection the curved scissors closed may be used in the same manner. Bands that do not yield readily are divided with the scissors. This dissection is done rapidly, and the bleeding is usually insignificant and may be disregarded, but free bleeding must be controlled by the application of ligatures.

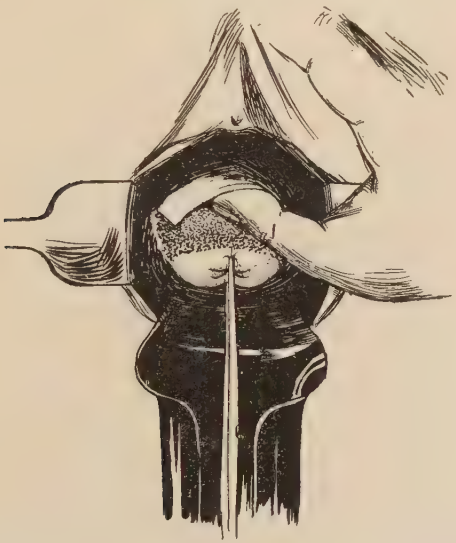


FIG. 134. Showing method of peeling up anterior flap with the thumb as a dissector.

The cervix is drawn forward against the pubis and the dissection is continued posteriorly until the peritoneal fold of Douglas's pouch is reached. This is opened and the incision is extended laterally to the broad ligament on each side.

The cervix is then drawn backwards against the perineal retractor, and the dissection is continued anteriorly, hugging the face of the uterus to avoid injury to the bladder, which is peeled off from the anterior face of the uterus by this dissection. When the vesico-uterine fold

of the peritoneum is reached it is divided across the face of the uterus from one broad ligament to the other.

The perineal retractor is then removed, and the forefinger is inserted through the posterior incision into the peritoneum and is swept around the fundus and adnexa, separating any adhesions that may be reached and broken up in this manner. The same maneuvre is executed anteriorly to the uterus, passing the finger or two fingers through the incision between the uterus and bladder. The perineal retractor is then replaced, and the long, narrow anterior retractor is inserted between the bladder and uterus to lift up and protect the bladder.

The uterus is now suspended only by the broad ligaments on either side, which contain the important blood-vessels that are to be secured before it can be removed.

The traction ligature or bullet forceps fastened in the cervix is grasped in the left hand, and the uterus is dragged well down over to the right, while the index finger of the same hand is passed up behind the base of the left broad ligament as a guide for the ligature to be passed around the uterine artery. The aneurism needle armed with a stout silk ligature is carried around the left uterine artery from before backwards, on the guiding finger behind, close to the side of the uterus. (See Fig. 135.) The loop of the ligature is caught with a blunt hook and one end is drawn through. The aneurism needle is then withdrawn, leaving the ligature in position. This ligature is tied firmly, and the intervening tissue between it and the uterus is divided with scissors close to the side of the uterus. If the severed uterine end of the artery bleeds it is caught temporarily with pressure forceps. The cervix is now drawn well over to the other side (left), and the right uterine artery is ligated in the same manner and divided, the uterine end being clamped if necessary.

This leaves the uterus attached by the upper half of each broad ligament only, and if it is not large the fundus can be rolled out into the vagina through the anterior incision. The uterus is dragged down as far as possible, and a bullet

forceps is fastened into the anterior face well up near the fundus. While traction is made upon this the cervix is forced back into the vagina posteriorly, and the fundus slips out and under the bladder into the vagina. If it does not come out readily the perineal retractor is removed and the index and middle fingers are passed up through the posterior incision and pressure is made upon the

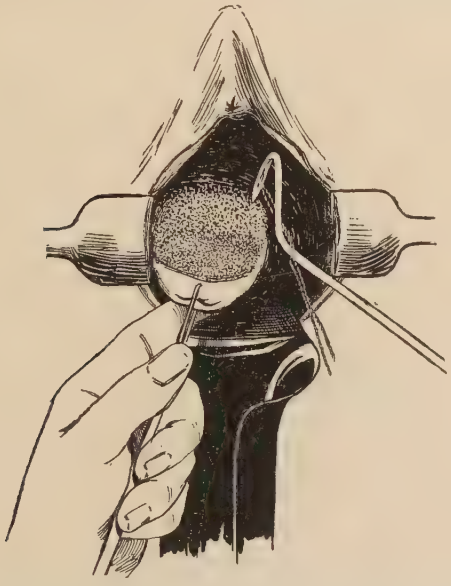


FIG. 135. Showing method of passing the ligature around the uterine artery. The artist should have placed the point of the needle a little more to the right of the cervix.

fundus from behind. (See Fig. 136.) This done, clamps may be applied to the broad ligament on each side from above downward.

If the uterus is small and the adnexa are to be removed, the clamps are applied to the outer side of the ovary, and if they are to remain, the clamps are applied to the inner side. If the uterus is large and there is not sufficient room for satisfactory manipulation, the clamps are applied near

the uterus. Then the intervening broad ligament between the clamp and the uterus on each side is divided with scissors, which frees the uterus, and it can be lifted out of the way. Then the appendages may be more readily examined and the ligatures applied to the remaining vessels.

In applying these clamps to the broad ligaments, which contain the remaining unsecured vessels, viz.: the round ligament and the ovarian artery on each side, care must

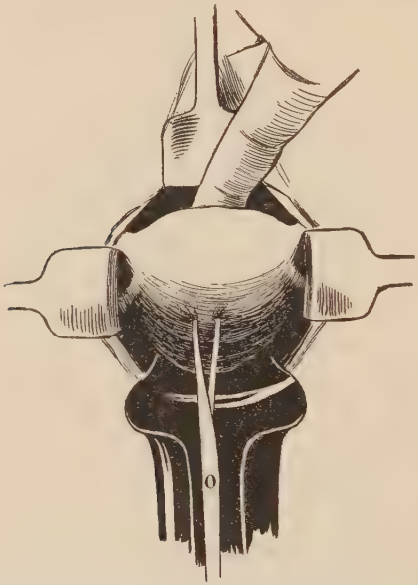


Fig. 136. Showing the method of delivering the fundus through the anterior incision. The bullet forceps is attached to the anterior border of the fundus and the index finger is passed in behind it from above.

be taken to adjust them so as to include the whole of the undivided broad ligament above the ligature securing the uterine artery on each side. If they are carefully and securely adjusted there need be no apprehension concerning the vessels they compress, which are afterwards picked up and ligated separately.

The uterus having been removed, the vessels secured

by the clamps on each side are then ligated to the outer side of the clamp. A medium sized silk ligature is passed under the vessel either by means of the aneurism needle or a curved needle with carrying thread in the grasp of a needle holder. The ovarian artery is ligated first, and the point of ligation will be near the clamp if the ovary is to be left, or to the outer side of the ovary if it is to be removed.

The round ligament with its accompanying vessel is next ligated in the same manner near the clamp. When these ligatures are tied on each side the clamps are removed. Any bleeding points discovered after removing the clamps are picked up and ligated with catgut.

Some operators prefer to leave these clamps on for forty-eight hours, instead of ligating the vessels, packing the intervening space and around the handles with iodoform gauze for drainage and to protect the vagina.

The pelvis is now flushed with sterilized normal salt solution, warm, and it is sponged out until the water returns clear. All clots are removed by sponging, and if the omentum or a loop of intestine comes down it is carefully pushed back.

The ligatures are cut short, and strips of sterile iodoform gauze two inches wide are passed up into the pelvis by means of dressing forceps. The amount of gauze used is sufficient to fill the space occupied by the uterus to prevent prolapse of the intestines. The ends of these strips project into the vagina, which is then packed firmly, but not tightly, with gauze also.

The urine is now drawn, then the vulva is dusted with markasol, and a vulva pad of plain sterile gauze is applied and held in place by a T binder.

After Treatment.—The bowels are moved on the third or fourth day by a laxative, followed by an enema of plain warm water. Straining during evacuation of the bowels must be carefully avoided. After this they should be moved every second day.

If there is no discharge from the vagina, the dressing

may be left undisturbed for four or five days, or even longer. It is removed from the vagina first, and a portion of that in the pelvis is removed at the same time if it is loose, and comes away without much traction. Two days later more is removed, and so on until all has been taken away. In removing the gauze the patient should be brought to the edge of the bed on her back, and the small blade of the author's speculum is carefully inserted under the gauze along the posterior wall of the vagina, the gauze being then removed with dressing forceps.

Vaginal douches should not be used during the first three weeks, unless there is some positive indication therefor. After this a daily douche of warm one *per cent.* solution of markasol may be used until the vaginal vault is completely closed.

The patient should be confined to bed in the recumbent posture for at least three or four weeks, and should avoid straining or lifting for several months.

CHAPTER XXVII.

REMOVAL OF THE VERMIFORM APPENDIX.

In the course of intra-abdominal operations the appendix is sometimes found attached by adhesions to pelvic tumors, to inflammatory masses involving the adnexa, to the retro-displaced uterus when adherent, or to the small intestine, and it may be so much involved as to require removal. Sometimes, in separating adhesions encompassing these structures, the adherent appendix is peeled off without being recognized. Then again the appendix may be diseased independently. Therefore, whenever the abdomen is opened, the appendix should always be examined, and when its condition warrants, it should be removed. This can be done quite as readily through the median incision as through an incision over the site of the appendix, the cæcum being brought up into the incision and protected by a gauze pad placed under it.

When the abdomen is opened especially for removal of the appendix, the incision is made over its site, preferably across the center of a line drawn from the umbilicus to the anterior superior spine of the ilium. It is rarely necessary to make this incision more than an inch or an inch and a half or at the most two inches in length, or only just sufficient to permit the introduction of the middle and index fingers, with which the appendix is grasped and brought up into the incision.

The same precautions are to be observed as in making the median incision in ordinary celiotomies, as has already been described. When the peritoneum is reached it is picked up with thumb forceps to free it from the underlying intestine and divided carefully. Then the index finger of the left hand is inserted and it is lifted up, and the incision in the peritoneum is enlarged by dividing it

above and below along the finger as a guide. The middle and index fingers are now inserted and moved downward along the outer side of the colon until the head of the gut is reached, when the appendix can usually be recognized lying under it. It is not always possible to find it readily at first, especially if it is folded down upon the cæcum and adherent to it, and it will then be necessary to draw the cæcum out through the incision for inspection.

Firm adhesions of the appendix should not be separated blindly within the peritoneal cavity with the finger, as there is great risk of tearing it or tearing into the intestine to which it is adherent. In such cases the cæcum should be drawn up through the incision, and a gauze pad placed under it, while the appendix is isolated by dividing the adhesive bands carefully with the scissors or scalpel.

Sometimes the appendix will appear to be absent when it is covered over and buried in a mass of adhesions or old exudation upon the surface of the cæcum. By grasping the gut between the thumb and finger a cord like thickening of a portion of its wall may be made out. This will prove to be the appendix. Careful dissection may succeed in isolating it from its bed. To accomplish this the gut is made tense at this point by grasping the remainder in the hand, while the separation is made from below upward by careful dissection with the scalpel, that is from the extremity of the appendix to its junction with the gut. It will require the greatest care in these cases to avoid wounding the gut, which, if done unavoidably, should be closed immediately with Lembert sutures of fine silk.

Technique of Removing the Appendix and Disposing of the Stump.—When the appendix has been freed from adhesion to adjacent structures it is lifted up and straightened out, putting its mesentery on the stretch. A ligature of fine silk or catgut is now carried around the outer border of the mesentery near the colon (see Fig. 137) by means of a curved needle with carrying thread, which is made to transfix the mesentery from beneath. This when tied secures the principal vessel which runs along the border of the

mesentery. The mesentery is then divided below this ligature across to the appendix, just below its junction with the cæcum. (See Fig. 137.)

There are several methods of disposing of the stump after the appendix has been cut off. One is to ligate the appendix just below its junction with the cæcum, amputate it with scis-

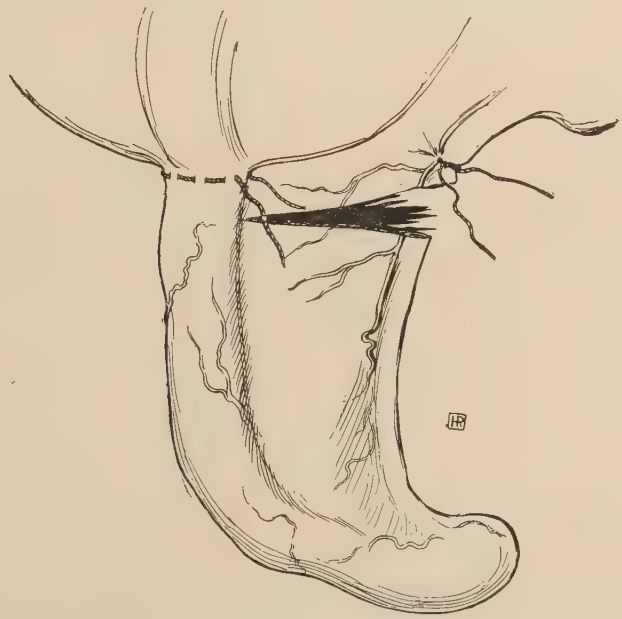


FIG. 137. Showing ligature applied to the mesentery of the appendix, the mesentery divided below it to the appendix, and the purse-string suture introduced which serves to close the opening after the stump has been invaginated.

sors below the ligature, wipe the cut end of the stump dry, and cauterize it either with a pointed Paquelin cautery or with a drop of carbolic acid conveyed upon a glass rod or one blade of a pair of dressing forceps. Care must be taken to confine the acid to the interior of the stump, which should be surrounded by a gauze pad to protect other structures. The stump is then dropped back into the peritoneal cavity without further attention.

Another plan is to divide the peritoneal covering of the appendix all around a short distance below its junction with the cæcum before applying the ligature. The peritoneum is then stripped back, forming a sort of cuff; the ligature is then applied to the appendix devoid of its peritoneal covering, and the appendix is cut off below the ligature. The end of the stump is then wiped dry and cauterized, and the peritoneal cuff is drawn down over it and united by sutures inserted so as to turn in the margins when tied. The margins

Fig. 138. Showing method of invaginating the stump, the position of the purse-string suture after invagination, and also the continuous suture employed for bringing together the margins of the divided mesentery of the appendix.

of the divided mesentery are brought together by a continuous catgut suture, thus avoiding subsequent adhesions by leaving no raw surfaces.

Another method is to invaginate the stump by pushing it into the interior of the gut and uniting the peritoneum over it by sutures which include the muscular layer of the gut wall, as well as the peritoneum.

My own plan, a modification of the latter, is illustrated

by Fig. 138. Before invaginating the stump a purse string suture is applied around the circumference of the appendix, close to its junction with the cæcum. This suture penetrates the muscular layer of the appendix at every bite, being introduced by means of a fine curved needle. The ligature material is fine, strong silk. This ligature is now drawn tight but not tied, and the appendix is amputated a quarter of an inch below. The end of the stump is wiped dry and cauterized. The margins of the stump, including the peritoneal covering, are caught with a pair of Halsted's hemostatic forceps, which have a long thin beak, and the stump is pushed into the interior of the gut, the purse string ligature being loosened to permit the invagination. The forceps are then removed and the purse string ligature tied securely. The tying of this ligature effectually closes the opening into the gut, approximating the peritoneal surfaces perfectly, and leaving no visible stump upon the surface of the gut.

The divided margins of the mesentery are drawn together by a continuous suture of fine catgut.

This method does away with all raw surfaces, and obviates the formation of fresh adhesions of the cæcum to structures adjacent to it subsequent to operation.

The after-management of these cases is the same as that of any other abdominal section. The bowels should be moved freely on the second or third day, and every day thereafter during convalescence. The diet is the same also. Pain in the region of the appendix following operation may be combated by the external application of ice or high enemata of hot water, using the water hot enough to stimulate peristalsis, which will cause the gas to be expelled. The addition of two or three ounces of the milk of assafœtida to these enemata will aid in producing the desired result.

If deep silkworm gut sutures are employed for closing the wound in the abdominal wall, over the appendix, they are removed on the twelfth or fourteenth day. Except where the abdominal wall is very fat the continuous layer suture of chromic catgut is to be preferred to the deep suture of silk or silkworm gut. The peritoneum should always be sutured

separately in any case. If the abdominal wall is fat, a temporary drain of folded rubber tissue should be inserted at the upper and lower angle of the wound. This is removed after twenty-four or forty-eight hours by lifting up the edge of the dressing above and below, but not otherwise disturbing it.

CHAPTER XXVIII.

OPERATION FOR ECTOPIC GESTATION.

The character of the surgical procedure to be adopted for ectopic gestation will depend upon the following contingencies, viz.:

1. If the fœtus is within the tube which has not yet ruptured.

2. If hemorrhage has occurred into the tube, distending it without rupture.

3. If the tube has ruptured and active bleeding is still going on.

4. If hemorrhage has ceased and there is a well organized clot to be felt through the vagina.

4. If decomposition with suppuration has occurred.

5. If the fœtus has continued to develop within the abdomen and has gone nearly to term.

The rule in operating for ectopic gestation is that the tube should be preserved whenever possible, and it should not be removed unless it is so far distorted or destroyed that regeneration is not possible. Even where rupture has occurred it is often possible to preserve the tube. Care must be taken, however, to make sure that the lumen of the tube is free by passing a sound through it into the uterus.

An ectopic gestation may be reached either through an abdominal or vaginal incision, but since it is possible to do better conservative work through an abdominal incision, this route is to be preferred. The vaginal route is, however, preferred by some surgeons even for conservative work. It cannot be utilized when the tube has ruptured and active bleeding is still going on.

If the tube has not ruptured, it is safer to operate without delay, as soon as the diagnosis is made, since rupture with

fatal hemorrhage may occur at any moment. In these cases as soon as the abdominal cavity is opened two fingers are inserted and are swept carefully around the tube in front and behind, separating any adhesions that may be detected. The tube is drawn up into the abdominal incision, great care being taken to avoid rupture, and it is surrounded by gauze pads to protect the peritoneal cavity. The tube is then split longitudinally on its upper surface, the fœtal sac removed and the tube washed out, as directed under the head of "Salpingectomy." A probe is passed through it into the uterus to make sure of its patency. Then the incision in the tube is closed by a continuous suture of fine catgut or silk. The abdominal incision is closed without drainage. To control hemorrhage, if necessary, while evacuating the tube, a clamp may be applied temporarily to the ovarian artery at the side of the uterus, and another at the pelvic brim.

If hemorrhage has occurred into the tube which is still unruptured, if the distention has not been so great as to preclude the possibility of regeneration, it may be dealt with in the same manner as described above, provided it is possible to control the hemorrhage without ligating the ovarian artery.

If the tube has ruptured it is even then sometimes possible to preserve it, suturing the torn edges together after the tube has been cleared out and the hemorrhage has been controlled.

If the tube has ruptured and active bleeding into the peritoneal cavity is still going on, the abdomen should be opened without delay and the hemorrhage arrested. The blood in the peritoneal cavity is rapidly ladled out, and the tube exposed and brought up into the abdominal incision. To control the bleeding quickly, a temporary clamp may be applied to the broad ligament at the side of the uterus, including the tube and ovarian artery, and another to the outer side of the tube at the pelvic brim. These are removed afterwards without applying ligatures, if it is decided to preserve the tube, and the torn vessels are ligated at the point of rupture. The tube is then cleared out, washed out, and

the edges are drawn together by a continuous suture. But if the tube is so far destroyed as to render its regeneration impossible, ligatures are applied and the tube removed. Excision of the tube is done in the same manner as has already been described under the head of "Salpingectomy." The tube at the uterine side of the sac is not to be constricted by a ligature and its lumen obstructed. The ovarian artery is tied in the broad ligament below the tube at the point where it is divided, and the stump of the tube is left open, interrupted sutures being inserted so as to unite the peritoneal covering and the mucous coat within to insure the patency of the opening. A probe is inserted through the tube into the uterus to insure the patency of the tube at that point. The ovary is not disturbed unless it is found to be diseased and requires removal. When left behind it is attached by suture to the stump of the tube.

If the tube ruptures between the folds of the broad ligament, the amount of hemorrhage that can occur is limited, and it will cease spontaneously. No immediate operative procedure is, therefore, demanded. When the clot has become firm and time has been allowed for closure of the ruptured vessel (from two to three weeks will usually suffice, the patient meantime being kept quiet, in bed, if necessary), an incision is to be made through the vaginal wall into the sac at the most dependent point, the clots are broken up with the fingers and removed, the cavity is washed out and a drain inserted. If there is much free bleeding that is not readily controlled by hot irrigation with iodine solution, the cavity must be packed firmly with sterile iodoform gauze and the vagina filled with the same afterwards. After two or three days this is removed and it is to be reapplied only if the bleeding persists. If there is no recurrence of the bleeding upon removing the gauze, either a thick roll of gauze or a drainage tube is inserted through the opening to prevent closure and to drain the cavity. Drainage must be maintained until the sac closes from the bottom. If strict asepsis is observed throughout these manipulations there will not be excessive suppuration. The cavity should be carefully irrigated every day when the discharge is purulent.

If rupture has occurred with hemorrhage into the peritoneal cavity that has ceased spontaneously it is wiser to keep the patient quiet in bed for two or three weeks until the ruptured vessel has become sealed, when the clot will be firm and walled off from the general peritoneal cavity by fibrinous exudation surrounding it which makes it practically extra-peritoneal. These cases are then dealt with in the same manner as when the hemorrhage has taken place between the folds of the broad ligament, viz., by vaginal evacuation and drainage. Care must be taken, however, to avoid breaking through the wall of exudation, while evacuating the clot, and subsequently also while irrigating the cavity. It is a wise precaution not to encroach too much upon the wall of the cavity in breaking up and evacuating the clot, for in some instances troublesome hemorrhage has occurred necessitating an abdominal incision to control it. It is much better after removing the greater part of the clot to pack the cavity with gauze and wait for the remaining clot to become loosened.

If decomposition has already occurred in the sac which is sometimes the result of infection from the rectum, owing to its close proximity, it must be evacuated through the vagina at once and drained, as has already been described.

In all these cases the incision in the vagina must be made large enough to extract the fœtus, which sometimes continues to grow after its escape from the tube.

If the fœtus has continued to develop in the peritoneal cavity and has gone nearly to term, it may be removed through an abdominal incision, but the method of procedure will depend upon whether the fœtus is living or dead. If the fœtus is living the operation is fraught with considerable danger on account of the liability to excessive hemorrhage from detaching the placenta. If the placenta is attached to the broad ligament, uterus or abdominal wall, the hemorrhage may be controlled by ligatures passed deeply into the tissue all around the point of attachment, then detaching it. But if the attachment is to the intestines, the vessels going into the placenta cannot be tied. Then the only thing to be done is to tie off the cord as short as possible, pack

gauze around the placenta, and trust to its being detached spontaneously. There is then great danger of infection and even uncontrollable secondary hemorrhage.

If the fœtus is dead and the demand for operation is not urgent, it will be better to wait until the vessels leading into the placenta have been closed by formation of thrombi. The detachment of the placenta is not then attended with so much risk. A delay of several weeks will be necessary.

In these cases of advanced abdominal pregnancy it must be borne in mind that it is sometimes possible to preserve the life of the child if operation is not delayed too long. The life of the child is always jeopardized by false labor setting in or by absorption of the liquor amnii which may occur in the last months, permitting the fœtus to be pressed upon by surrounding organs and structures.

CHAPTER XXIX.

NEPHROPEXY.

(Fixation of Prolapsed Kidney.)

Prolapse of the kidney (so-called floating kidney) occurs so much more frequently in women that a description of the technique of its fixation is considered appropriate here in connection with other gynecological operations.

The success of the operation will depend greatly upon careful and painstaking preparatory treatment to obviate the strain of retching and vomiting afterwards. See chapter on "Preparation of Patients for Gynecological Operations."

The patient being anæsthetized is placed on the table on the side opposite to the kidney that is prolapsed, with a firm round pillow or roll under her, below the level of the ribs, so as to increase the costoiliac space on the side of operation. The surface about the location of the proposed incision is rendered aseptic in the manner already described for abdominal incisions.

The twelfth rib is located, and the incision is commenced half an inch below, close to the outer border of the erector spinæ muscle (from three to four inches from the median line of the spine), and is continued down parallel to the spine for a distance of two and a half or three inches. This incision is made through the skin and underlying fat down to the superficial fascia. This is divided to the extent of the skin wound, and the knife is then laid aside. Any superficial vessels that have been divided should be clamped with hemostatic forceps. The margins of the wound are drawn apart by means of broad retractors, and the muscles are separated in the direction of their fibres by means of blunt hooks down to the quadratus lumborum, the retractors on each side being

made to gather in all the tissues as they are separated, exposing constantly the extreme depth of the wound. The outer border of the quadratus lumborum is drawn aside towards the spine by means of the retractor on that side, and separation of the tissues is continued until the circumrenal fat is exposed. It will sometimes be necessary to divide the lumbar aponeurosis by means of scissors, so as to expose the renal fat beneath. In this manner no vessels are wounded; consequently there is no hemorrhage and the muscular fibres have not been divided. A second assistant now grasps the kidney through the pendulous abdomen, and pushes it upward and backward into the wound, where it can be distinctly felt and seen after clearing away the surrounding fat. The fat should be divided freely along the renal border and the kidney pushed up through it, the finger being inserted and swept over the surface of the kidney, so as to excite subsequent plastic inflammation which aids in its fixation.

Some operators split the capsule of the kidney and attach the margins of the severed capsule to the muscle on each side by means of chromicized catgut sutures, but this is not considered always necessary.

Two sutures passed through from the skin surface and through the kidney structure and tied firmly, so as to draw the kidney well up into the wound and in contact with the muscular structure, will be sufficient. These sutures of some permanent material, as silkworm gut or kangaroo tendon, are to be inserted near the upper margin of the skin incision on each side and through the lower border of the kidney, going well down into the kidney structure. When drawn up and tightened they pull the lower border of the kidney up nearly to the level of the upper angle of the wound. Before they are tied a strip of several layers of gauze is inserted down to and against the exposed surface of the kidney, and is brought out at the lower angle of the wound. This will aid in stimulating plastic inflammation about the kidney. The remainder of the wound below the silkworm gut sutures is closed by interrupted sutures of chromicized catgut inserted through the skin and separated muscles beneath.

The wound is dressed with moist absorbent gauze so as to take up the oozing from the gauze drain, and over this is placed an abundant layer of absorbent cotton, which is held in place by broad strips of adhesive plaster and a bandage that encircles the waist, a pad being placed on the abdomen over the location of the kidney.

The gauze drain is to be removed on the third or fourth day and a fresh dressing applied the same as at first. The patient is confined to the recumbent position, but may turn from side to side at her pleasure.

The period of confinement to bed should be three weeks.

The sutures are removed at the end of two weeks.

The patient must be placed upon tonic remedies, to build up her general health, and she should avoid strains or unusual exertion for at least a year following the operation.

CHAPTER XXX.

ACCIDENTS THAT MAY OCCUR IN THE COURSE OF ABDOMINAL OR VAGINAL SECTION.

The bladder, ureters, or intestines may be inadvertently wounded during an abdominal or vaginal section. These accidents have happened to the best operators, though every precaution is taken to avoid them. Though they are to be regarded as grave complications, when they are promptly and properly repaired the result is usually good. Wounds of the bladder are less serious, as a rule, than those of the ureters or intestines, and their repair is effected more readily. The most serious wounds of this organ are those that are overlooked, as when the bladder wall has been encroached upon in separating it from structures to which it is attached or adherent, and it is left so thin at some point, or its vitality is so much impaired, as to cause sloughing and subsequent leakage.

Wounds of the Bladder.—Simple incisions or tears are to be repaired by interrupted sutures of chromicized catgut inserted close together, and penetrating the thickness of the bladder wall down to, but not including the mucous membrane lining of the interior of the bladder. Whenever possible the wound should be covered afterwards with peritoneum, by drawing down over it the flap of vesical peritoneum and attaching its margin by suture to the tissue below the wound.

If a piece of the bladder wall has been excised, the wound must be drawn together in the direction that offers the least resistance, and the margins united by interrupted sutures, as described above.

After the sutures have been tied, the bladder is distended by injecting into it a solution of boracic acid, and the line of union is carefully examined to detect weak points where

leakage may occur. If discovered, they are to be reinforced by additional sutures.

It is perhaps safer to leave a self-retaining catheter in the bladder for drainage, to keep it empty for a week afterwards. But if it is decided to omit this, the urine should be drawn at least every four hours during the first week.

When the bladder wall has been made thin by stripping it off from structures to which it is attached or adherent, the thin portion should be reinforced by drawing together over it the margins of the sound portion of the bladder wall, by means of a continuous suture of fine chromicized catgut. Care must be taken not to penetrate the entire thickness of the bladder wall with these sutures, but enough of the muscular tissue of the bladder wall must be included to make them hold firmly.

Wounds of the Ureters.—If the ureter is punctured by a needle, the point of puncture must be located and one or two Lembert sutures of fine silk inserted just over the point of puncture, or on each side, but close together. The puncture may be located definitely by compressing the ureter below the suspected point, permitting the ureter above to become distended with urine, when a leak may be detected by close observation.

The sutures are inserted into the wall of the ureter, under the peritoneum, this being incised and drawn aside to expose it when necessary. Afterwards the peritoneum is drawn together again over it by means of a continuous suture of fine catgut.

If the ureter has been included in a ligature, the ligature must be cut immediately and reinserted, excluding the ureter. The ureter must then be carefully examined to see if its integrity has been destroyed. If so, it is divided and the upper end implanted into the lower, as described below.

When the ureter has been cut, if it occurs near enough to the bladder, the upper end is implanted into the bladder at a point where there will be the least strain upon it, preferably as low down as possible. The lower or bladder end of the severed ureter is caught up and ligated so as to obliterate it.

Then, selecting the point for implantation, a pair of long, curved, narrow-bladed dressing forceps are inserted through the urethra into the bladder, and the point is directed against the wall from within the bladder at the location selected for incision.

An incision is made through the bladder wall with a narrow scalpel down upon the end of the forceps within, just large enough for the end of the ureter to fit into it snugly.

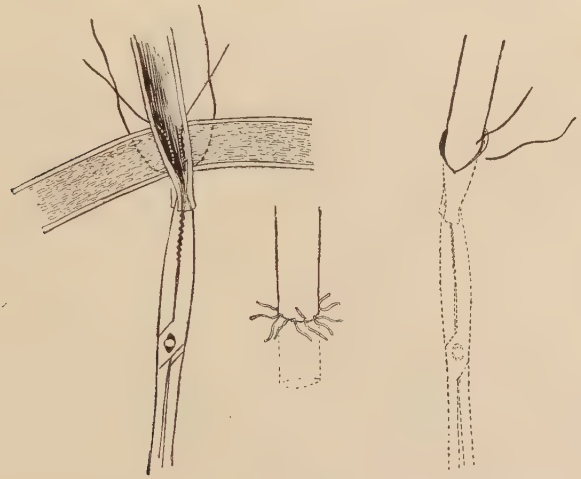


FIG. 139. Showing method of inserting ureter into the bladder.

The forceps in the bladder are now passed out through this incision, and the blades are separated so as to grasp the end of the ureter and draw it through into the bladder. (See Fig. 139.) The end of the ureter is first split for a short distance to enlarge its orifice. The ureter is then attached to the margin of the incision in the bladder wall by means of interrupted sutures of fine silk inserted around its circumference. (See Fig. 139.)

If the ureter is cut at a distance from the bladder too great to permit implantation, the upper end of the severed ureter may be implanted into the lower segment. The end of the lower segment is first ligated to obliterate the opening,

then a longitudinal slit is made through the wall of the ureter below the ligature, just sufficient to receive the end of the upper segment. (See Fig. 140.) The end of this upper segment is cut off obliquely, to enlarge the orifice and avoid constriction. Traction sutures of fine silk are now inserted on each side, at the lower angle of the slit in the lower seg-

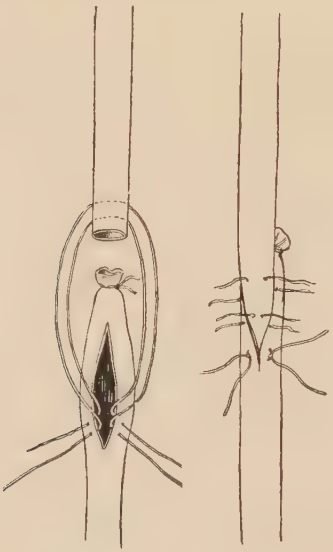


Fig. 140. Showing method of inserting the upper section of ureter into the lower section.

ment, passing first from without inward, then passing through the wall of the upper segment of the ureter, a short distance from the end, then again through the lower segment, at the lower angle on the opposite side of the slit. (See Fig. 140.) Thus, when these sutures are drawn upon they serve to pull the end of the upper segment through the slit in the lower segment. They are then tied and additional sutures are inserted where necessary to strengthen the junction. (See Fig. 140.)

The peritoneum, which has been drawn aside, is now

brought together over the junction and united by a continuous suture.

Injuries of the Intestines.—Punctures of the intestinal wall must be closed immediately with one or two Lembert sutures of fine silk, which, when tied, approximate the peritoneal covering over the opening; or the same thing may be accomplished by inserting a purse-string suture around the puncture and tying it.

If the peritoneum has been stripped off, the margins of the remaining sound peritoneum must be brought together carefully by a continuous suture of fine silk.

An incision or tear in the gut wall must be immediately repaired. If it involves only the peritoneal coat, the edges are brought together by a continuous suture of fine silk as above. If it extends through the gut wall and opens into its lumen, interrupted Lembert sutures of fine silk, placed close together, are inserted, taking care to penetrate deep enough to include the fibrous sub-mucous layer, but not to include the mucous lining of the bowel. As soon as the wound is discovered, the intestine is drawn up into or outside of the abdominal incision and surrounded with gauze pads to protect the peritoneal cavity from contamination. The surface of the bowel surrounding the wound must be carefully wiped off with gauze dipped in hot normal salt solution to cleanse it both before and after the sutures are inserted.

A fine cambric needle, threaded with fine silk, is best for suturing the intestines, and is employed, also, for uniting the ends of the gut when a resection is made.

If the intestinal wall has been so much injured that repair is not possible, or if the mesentery supplying a portion of the bowel has been so much injured that the vitality of that portion of the gut is threatened, it is best to resect it and unite the ends by suture. These sutures must be so applied as to turn in the margins of the gut and approximate the peritoneal covering of the bowel accurately all around. Great care must be exercised to have the sutures penetrate deep enough to include the submucous fibrous coat (of Halsted), but they must not penetrate the mucous lining of the bowel.

The loop of intestine to be thus resected must be brought up into the wound and surrounded with gauze pads, so as to isolate it from the remainder of the peritoneal cavity or its contents. The bowel is then emptied of its contents at the field of operation, by stripping it between the thumb and fingers in opposite directions from a central point. A fillet of gauze is then passed through the mesentery with the aid of pointed dressing forceps, close to the side of the bowel, at a point some five or six inches from each end of the portion to be resected. These are now tied, not too tightly, but sufficiently so to prevent the escape of the bowel contents past these points to the field of operation. With the section of

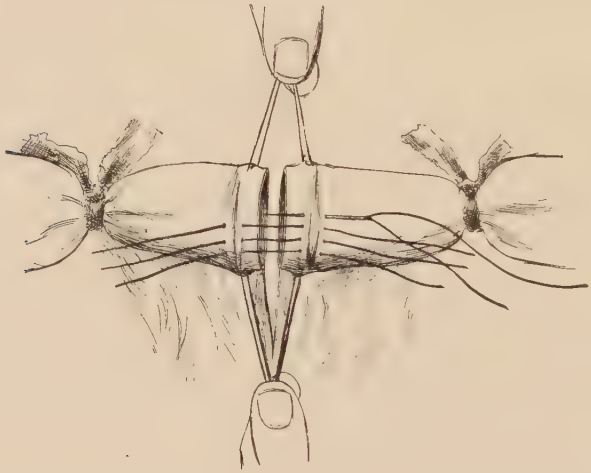


Fig. 141. Showing traction sutures for intestinal anastomosis and method of inserting Lembert sutures.

bowel removed, a triangular section of the mesentery, corresponding with it, must be removed also. It is best to outline this section of the mesentery, and carefully ligate all vessels leading into it just outside of the line of incision. Beginning at the apex of the triangle, the mesentery is then divided with strong scissors along both sides down to the side of the gut, and, finally, the gut is removed by dividing it with scissors at the points selected at the termination of

the lines of section of the mesentery. The interior of the intestinal ends must be carefully wiped out with pledgets of gauze, held in dressing forceps, to avoid soiling the hands. The gauze pledgets must be used but once and the forceps must be sterilized before they are used again for any other purpose.

Four traction sutures are now inserted on each side of either cut end of the gut, a short distance back from the margin. (See Fig. 141.) When these are drawn upon, a ridge or fold is made in the gut wall, a short distance from the edge where the joining sutures are to be inserted. These traction ligatures are held by an assistant, approaching the

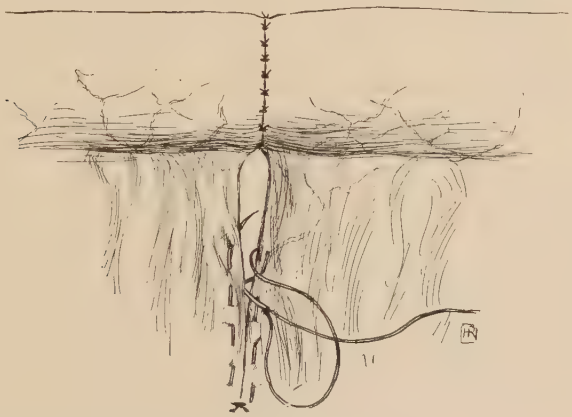


FIG. 142. Showing intestinal sutures inserted and tied and method of suturing the mesentery.

ends of the gut and putting the walls of both ends on the stretch. (See Fig. 141.) The sutures are then inserted around the circumference of the gut, as shown in the figure. These sutures should penetrate the peritoneum, muscular layer and sub-mucous fibrous layer of the gut wall, but must not include the mucous membrane lining the gut.

At least a dozen needles should be threaded before beginning the insertion of the sutures, each with a ligature of sufficient length to make three sutures. Beginning at the side to which the mesentery is attached, when all have been in-

serted on one side, from one pair of traction ligatures to the other, they are tied, and those on the other side are then inserted and tied. The edges of the divided mesentery are then brought together with a continuous suture of fine catgut, beginning at the apex of the triangle and terminating at its junction with the gut. (See Fig. 142.)

The fillets constricting the bowel are now removed, and it is permitted to distend, when the junction is examined carefully for weak points that are immediately reinforced by additional sutures if found. The surface of the gut is wiped off carefully with a pledget of gauze wet with warm normal salt solution, and it is returned into the cavity.

If the operator feels sure that the suturing has been perfect, and that there is no danger of leakage, the intestine may be returned into the cavity and the abdominal wound closed without a drain. But if he has reason to fear subsequent leakage, a gauze drain is inserted down to the loop of joined intestine and left protruding from the lower angle of the abdominal wound, which is left open at that point. This may be removed in forty-eight hours, if there is then no need for drainage.

CHAPTER XXXI.

COMPLICATIONS THAT MAY ARISE IMMEDIATELY AFTER OR DURING CONVALESCENCE FROM ABDOMINAL OPERATIONS.

The chief complications that may follow abdominal operations are *shock, secondary hemorrhage,* and *peritonitis.* The methods of dealing with these complications are both preventive and combative.

Shock usually occurs during or immediately after operation, though it has been observed several hours after. It is always a question, however, if this late shock is not due to *secondary hemorrhage* that ceases spontaneously. The chance of shock may be greatly lessened or avoided by careful preparation of the patient for operation (especially enfeebled patients, operation upon whom should be delayed until improvement in the general condition can be brought about whenever possible), by rapid operating, to lessen the period of anæsthesia and exposure of the peritoneum, careful administration of the anæsthetic, avoidance of unnecessary loss of blood and unnecessary manipulations within the peritoneal cavity, and protection of the peritoneum including the intestines, and general surface of the body as well, from prolonged exposure on the table.

It is of the greatest importance always to distinguish promptly between shock and collapse due to hemorrhage.

To combat shock when it occurs reaction must be brought about promptly by the application of heat to the extremities, with vigorous friction and the administration of stimulants both hypodermically and per rectum. A thirtieth of a grain of strychnia with a half a dram of brandy should be injected under the skin, either into the sides of the abdomen or upper part of the thighs, never into the extremities, where the circulation is suspended, because it will not be absorbed

promptly. Half the dose of strychnia (1-60th of grain) may be repeated in half an hour or an hour, with the same amount of brandy. Two ounces of brandy with fifteen or twenty grains of carbonate of ammonia and half pint of warm water may be injected into the rectum, and repeated after three or four hours. Where a quick heart stimulant is required a hundredth of a grain of nitroglycerine may be injected under the skin and repeated in two hours.

When shock has been precipitated by loss of blood, the loss to the volume of the circulation must be replenished by the subcutaneous injection of warm normal salt solution. This is best given in the neighborhood of the breasts, where the cellular tissue is abundant and will accommodate sufficient of the fluid to be effective.

A very efficient apparatus for this purpose may be extemporized with a hypodermic needle point and a fountain syringe. The syringe, tubing and needle point should, of course, be made sterile. The needle point is adjusted into the end of the tube from the fountain syringe, and fastened securely to prevent leaking by tying with a strong linen thread or silk ligature. The bag is suspended five or six feet above the level of the body. The breast is drawn up and the surface of the skin under the gland is washed off carefully with a disinfecting solution and alcohol. Then, permitting the fluid to flow through the needle point, it is plunged deeply into the cellular tissue. As much as possible is projected into the cellular tissue, and when the distention is complete another point is selected. In this manner a very considerable amount of the solution can be gotten under the skin, and is absorbed rapidly. By using two points of puncture, with another reservoir or a large aspirating needle, the process may be hastened. It will be necessary to have the solution in the bag considerably warmer than desirable for injecting under the skin, because it runs so slowly through the tube that it becomes cooled off.

Secondary hemorrhage may be prevented by avoiding as far as possible mass ligatures, tying the vessels separately always in the stump, even when the stump or pedicle has

been surrounded by a ligature, by quilting the ligature around the circumference of the pedicle as described under ovariotomy and salpingectomy, by avoiding traction on ligatures after they are tied, by not cutting the pedicle too close to the ligature, and by using silk instead of catgut, because it does not loosen after it is tied.

It might be added, also, that secondary hemorrhage may often be averted by taking pains always to check extensive capillary oozing before the abdomen is closed, and by avoiding rough or careless sponging about the site of ligatures. Straining efforts at vomiting and coughing after an operation are often the cause of secondary hemorrhage by loosening a ligature or starting fresh oozing, and should be avoided as far as possible.

In view of the chance of the occurrence of this dreaded accident after every abdominal or vaginal section, either the operator or a competent assistant should remain with the patient or within easy reach until all danger from this source shall have passed. The instruments and everything that may be required for reopening the abdomen should also be kept in readiness. These are precautions too often ignored by otherwise cautious operators.

When there is undoubted evidence of secondary hemorrhage no time should be lost in reopening the abdomen if the operation has been a cœliotomy, or removing the dressings and re-entering the vaginal vault if it has been a vaginal section, and securing the bleeding point. No time should be lost with elaborate preparations.

The hands must, of course, be rendered sterile and the patient must be quickly transferred to a table near a suitable light, but no time should be consumed unnecessarily in arranging for light before beginning, as it will be of little service at first in the abdomen, because points where ligatures are known to have secured important vessels must be located by the sense of touch through the accumulated blood in the abdomen, and a clamp applied if it is discovered that the ligature has slipped. Thus much valuable time is saved. Rather the arrangement for suitable light,

which will be required afterwards, should be provided by some one designated for this purpose while these steps are being quickly executed.

The administration of the anæsthetic should be promptly begun, and pushed to the stage of unconsciousness as the abdomen is reopened.

No absolute rule as to the method of procedure to be pursued when the abdomen has been reopened can be formulated to suit contingencies that may be different in every case. Much must necessarily depend upon the judgment and coolness of the surgeon. The bleeding must be arrested in the quickest way possible. Sometimes he may be able to detect by the sense of touch a stump from which a ligature has slipped or loosened, because it will feel lax, whereas when the ligature is still holding it feels firm and bunched up.

When such a condition is encountered a broad ligament clamp is carried down along the finger as a guide and clamped upon the released pedicle, the blood being cleared away afterwards and other points sought for. If no cause for the bleeding can be discovered in this manner, no time should be lost in clearing the blood out of the pelvis and searching by inspection for bleeding points.

Meantime the patient should be given hypodermics of strychnia and brandy and also infusion of normal salt solution into the cellular tissue under the breasts. This last is the promptest and most effective form of stimulation that can be employed, and it should be given at once while steps are being taken to control the hemorrhage, so that no time may be lost in taking advantage of it. For the method of giving this see section on shock.

Rectal enemata of brandy with hot normal salt solution and external heat to the surface of the body will aid materially in bringing about reaction.

Peritonitis is an infrequent complication at the present day, owing to the perfected technique and strict aseptic precautions, which are the rule now. Peritonitis may be *traumatic* or *septic.*

The prevention of traumatic peritonitis consists in exposing and handling the intestines as little as possible, permitting no solution but the normal salt solution to come in contact with the peritoneum, and by covering over denuded areas with flaps of peritoneum wherever possible.

When it occurs, the bowels should be thoroughly evacuated by an active purge that will produce depletion. Then morphia should be given hypodermically in sufficient quantity and at intervals sufficiently frequent to keep the pain in abeyance and make the patient comfortable. I am well aware that a very different view is held by many good operators, and I am prepared for criticism upon this point; but the most rational manner of dealing with inflammatory conditions is to put the parts involved at rest, and I know of no better and safer method of accomplishing this than by the administration of morphia. It should never be given by the mouth, as its absorption is too uncertain. I am satisfied that much unnecessary suffering is produced and many patients are lost by active efforts at prolonged purgation in simple traumatic peritonitis. After an initial dose of a quarter of a grain, subsequent doses of one eighth of a grain every four to six hours are usually sufficient.

The application of cold to the surface of the abdomen, either in the form of an ice coil or an ice bag, will prove very effective in allaying pain and arresting the inflammatory process. By employing this properly the amount of morphia required will be greatly lessened.

Septic Peritonitis is prevented by adopting a strictly aseptic technique in operating and by carefully protecting the peritoneum from contact with infecting fluids that may be encountered in the course of the operation, by walling off the general cavity from the immediate field of operation, and by employing every precaution in evacuating fluid accumulations, especially pus sacs, to prevent contact with the peritoneum at the time; also by covering denuded areas with peritoneum, and the avoidance of pockets where serum or blood may collect and decompose.

At the start, when a diagnosis of possible septic peritonitis

can be made, the same line of treatment outlined under the head of traumatic peritonitis may be adopted, with the exception of the administration of morphia. The bowels should be thoroughly evacuated by calomel, followed by a saline purge, or when this cannot be borne on the stomach, small doses of calomel (one-tenth of a grain every half hour) may be administered until a grain and a half or two grains has been given, then followed by high enemata of Epsom salts.

When pus or fluid collections of any kind are detected by palpation through the vagina, these should be immediately evacuated, washed out and drained, preferably by means of a rubber drainage tube, held in place by a ligature passed through one side of the tube and one edge of the vaginal incision. If this does not afford satisfactory drainage, the lower angle of the abdominal wound should be opened and a drainage tube inserted as far down into the pelvis as possible. Sometimes it will be possible by this means to flush through and through from above downwards, thus washing out the pelvic cavity, and cleansing it more perfectly than can possibly be done through the one opening in the vagina.

In opening the abdominal incision, it will be necessary to enlarge it sufficiently to insert one or two fingers so as to detect pus pockets and direct the tube down into the pelvis.

When more extensive involvement of the general peritoneum has occurred, it will be necessary to reopen the wound freely to cleanse out the peritoneal cavity, if necessary drawing the coils of intestines out through the wound and protecting them by warm gauze towels, and cleansing them thoroughly of all organized lymph by means of gauze pads wrung out of hot normal salt solution. This should be done as rapidly as possible; then they are returned into the cavity and the abdominal wound is closed, leaving a drain in the lower angle of the wound and one through the bottom of the pelvis into the vagina.

CHAPTER XXXII.

THE AFTER-CARE OF PATIENTS CONVALESCING FROM GYNECOLOGICAL OPERATIONS.

The care of the patient after operations must be considered from the standpoint of the necessities arising as the result of the anæsthetic, and those resulting from the operation itself.

If the patient has been properly prepared, there will be little or no disturbance resulting from the anæsthetic, if the patient is put to bed in a darkened room, is kept perfectly quiet, and is permitted to sleep undisturbed until full consciousness is restored, or the after-exhilaration of the anæsthetic has passed. This holds even when anæsthesia has been prolonged. This is more particularly true when the anæsthetic has been well given and little of it has been used, and if the patient has yielded to its influence without a struggle. For this, if for no other reason, the preliminary administration of nitrous oxide gas is a great advantage, besides adding greatly to the comfort of the patient in the beginning.

The patient, upon being removed from the operating table, should be put to bed without delay, and the bed should be prepared carefully for her reception by being warmed with hot bottles between the sheets if the weather is cold or the operation has been exhausting. These bottles must be carefully wrapped so as not to come in contact with the body, and should be moved to one side when she is put in bed, and replaced afterwards. They should be placed near the feet, and about the legs particularly, so as to rapidly restore the bodily heat lost by exposure on the table and as a result of the operation. If her clothing has been soiled or has been wet during the operation, it must be changed before she is put in bed. The night dress and under vest are often wet by perspiration, and when so they must be changed before she is transferred to bed.

The nurse who is to attend the patient immediately after operation should preferably be one who has not been in the operating room. She is fresher, and there is none of the operating room odor about her. She should be left alone with the patient, who should not be disturbed by passing in or out of the room. To her is allotted the responsibility of noting symptoms that should be reported to the operator or his assistant before they depart. She must be competent. Then to her can be entrusted the entire charge of the patient for the first few hours. She should wear slippers with felt or rubber soles, so she can move noiselessly about the room, when necessary, and above all, her skirts must not be starched; for this sound is often a source of great annoyance to the patient when she is restless.

The nurse selected to care for the patient after an operation should be one whom the patient likes, and when possible she should be consulted upon this point. It is very essential that the nurse should be one who is interested in her work and is patient and soothing with her charge, and she must have tact. She should never be kept on duty until she is weary and exhausted, but must be relieved at stated intervals, when she may rest or go out to take recreation in the open air.

If the operation is a grave one, there should be two nurses on duty during the first week at least, and they should relieve each other. It is not a good plan to permit members of the family to relieve the nurse if the patient is very sick or requires much attention, or if the operation has been a serious one. Nor is it well to permit them to go in and out of the room, or even to see the patient for the first few days following the operation. It is quite unnecessary and only adds to the discomfort of the patient, who is certain to observe their anxiety and misinterpret it.

A clean bath towel under which there is a piece of rubber cloth to protect the bed or pillow is placed under the head, and an ordinary towel is adjusted under the chin and face to catch fluid that may be vomited suddenly, or mucus that runs from the mouth, and there should be a shallow dish or

pus basin placed conveniently on a table or chair beside the bed for the same purpose. The position of the patient should be, at first, on the back with the face turned to one side to prevent the secretion from the mouth from running back into the throat, which is certain to provoke coughing or vomiting.

The nurse should sit beside the bed in a position where she can watch the patient's face and occasionally feel the pulse, without moving so as to disturb her. The pulse and respirations are sufficient guide to the patient's condition, and she must not be disturbed.

The preparation of the bed to receive the patient is important. The bed should be a single or three-quarters' width, and should be so placed as to permit easy approach on both sides. It should be soft but firm, so the patient will not sink into an uncomfortable position. The bottom sheet should be smooth and pinned at the corners to the mattress with safety-pins to keep it in place. Across the center is placed a draw sheet wide enough to extend from the level of the middle of the back to the knees. Under this, a little narrower, is placed a piece of rubber cloth (rubber side up) to protect the bed. This draw sheet must be pinned through to the mattress at the four corners. The upper sheet should be well tucked under the mattress at the foot, and pinned there with safety-pins at the two corners. At the top the sheet must be folded neatly over the edge of the blanket and spread. If a pillow is permitted it must be very low at first, and the case should be of linen, which is cooler to the head and face.

There should be no timepiece in the room except the nurse's watch. Nervous patients are often disturbed by the striking of a clock, and it is better for them not to be able to watch the time.

The nurse must be warned not to talk to the patient about the operation. The surgeon will give all the information required upon this point. Nor should she talk of other operations. She should be bright and cheerful, but not boisterous, and must have the necessary ability and tact to

restrain and control the patient without any show of assumption.

As soon as the patient awakens from the anæsthetic the nurse should bathe the face and neck and hands with bay rum or camphor water, using a soft handkerchief or a piece of folded gauze.

This will prove very refreshing and do much to dispel the odor of the anæsthetic. The mouth should be rinsed out with either cold or warm water, as the patient prefers, and to this may be added a drop or two of the essence of peppermint, lemon or any other flavoring that is agreeable to her. If, however, the patient prefers not to be disturbed, this should be omitted or postponed until she desires it.

If mucus collects in the throat, it is removed by gargling with hot water, to which may be added markasol—a level teaspoonful to the cup.

Position of the Patient in Bed.—It is by no means necessary to confine the patient to the position on her back. Quiet is, of course, essential and she should not be changed too often, but after the first few hours, when the effect of the anæsthetic has passed off, she may be changed carefully to either side, if she desires it and if she can be made more comfortable thereby. Pillows should be placed against the pelvis and shoulders for support, and a small pillow between the knees. It will add to her comfort also if a small pillow is placed under the knees when she is on her back.

Bathing.—It will add greatly to the comfort of the patient if daily sponge baths are given after the first forty-eight hours. A sponge bath of one part alcohol or bay rum to three or four parts water is given the morning after the operation, and also on the following day. After that baths with warm water and soap may be given. The face and neck should be bathed first, taking care to protect the sheet by placing over it a bath towel. Then each arm and leg in succession should be bathed in a similar manner, taking care to dry each part before proceeding to the next. In this manner the whole body is gone over, a part at a time, the whole being done under a blanket placed under the top sheet, so as

not to expose the patient to cold or draughts. If there is an abdominal bandage surrounding the body, this should not be removed, and care must be taken not to wet it.

The patient's clothing must be changed often enough to preserve cleanliness and comfort—every day at least. The top sheet of the bed should be changed every day, and the draw sheet under the patient night and morning. The pillows under the head should be changed and replaced by fresh ones with clean cases night and morning.

After the fifth or sixth day, if the patient is doing well, she may be lifted out of bed onto a cot, the bed aired and the mattress turned, the bed being made up fresh. From this time on this may be done every second day.

Nausea.—This is usually the first symptom with which the nurse has to contend, and it sometimes proves most intractable. It is usually combated with small quantities of hot water—as hot as can be taken. A teaspoonful is given at a time and repeated every ten or fifteen minutes, and a mustard plaster may be applied over the pit of the stomach. If this does not relieve, teaspoonful doses of black coffee without sugar may be given. When these fail, relief is sometimes afforded by mixing the white of an egg with the same quantity of Vichy, and giving of this a teaspoonful every fifteen minutes. The following will relieve sometimes when nothing else will: Cerium oxalat. ʒ ss, bismuth subcarb. ʒ i, sodii bicarb. 40 grs., mixed in half a glass of cold milk or water, of which, after stirring well each time, a teaspoonful is given every fifteen minutes.

Failing with these, the stomach may be washed out with warm water or a half per cent. solution of markasol. If this is done before the patient leaves the operating table, while still under the anæsthetic, there will be very much less disturbance of the stomach afterwards. This may be done when the stomach seems irritable while the patient is still on the table. It is by no means advised as a routine measure, though it is advocated by some surgeons.

The stomach tube, well lubricated, is passed back into the throat, and, telling the patient to swallow, it is pushed down

as rapidly as possible, taking care, however, not to let it get doubled up in the throat or mouth, which would provoke retching. The tube should be grasped, each time, only three or four inches from the mouth, and pushed in that much each time, in the same manner as inserting a soft rubber catheter. If a longer grasp is taken, it will almost surely double up in the mouth or throat. When the tube is once in the stomach, it should be placed to one corner of the mouth, and must be held perfectly still and must not be moved up or down the esophagus or across the mouth. It is better to let the water flow into the stomach from a reservoir with tube attached rather than by pouring it in through a funnel, as is customary. A very nice and convenient reservoir for this purpose is a percolator fitted with a tube and cut-off. A piece of glass tubing may be fitted into the end of this tube for making the connection with the outer or syphon tube of the stomach tube. The stomach tube is, of course, either long enough to form a syphon, or is composed of two tubes—one, the stomach tube proper, and the other the outer tube connecting with it, lengthening it so as to form a syphon.

It is better to put in first about a pint of plain warm water, syphon this out, and then put in about a pint of a half per cent. solution of markasol, syphon this out, and then withdraw the tube. The stomach should then be kept perfectly empty, and the patient should be kept quiet. This may be repeated after several hours, if necessary, but usually once is sufficient.

Thirst.—After prolonged operations, and where there has been much loss of blood, thirst is often very distressing and persistent. This is best relieved by high rectal enemata of a quart of warm normal salt solution. It is better to give this after every abdominal section before the patient is removed from the table, because it is not so readily retained after the patient becomes conscious, and thus thirst is in great measure obviated.

The manner of giving this enema is important. If it is injected into the rectum it will not be retained. A long, stiff

rectal tube connected with a percolator, fountain-syringe, reservoir, or a funnel through which the solution should be poured slowly, is held three feet above the level of the table or bed upon which the patient rests. The rectal tube, well lubricated, is inserted first as far as it will enter without encountering obstruction, then permitting the solution to flow in slowly so as to fill and distend the rectum and smooth out the folds ahead of the end of the tube, it is pushed on into the sigmoid. The fluid in the lower section of the bowel may now be allowed to escape by inserting a small rectal nozzle alongside the tube. The end of the table upon which the buttocks rest is now elevated six or eight inches, and the solution is allowed to flow in slowly. The tube should be withdrawn slowly only after all the solution has run through and the cut-off has been closed, to prevent what remains in the tube from escaping into the lower section. Upon removing the tube the anal orifice is compressed for a few minutes by grasping the buttocks on each side and drawing them together.

After the patient has become conscious, these enemas properly given will be retained if not repeated more frequently than once in six or eight hours. At this time it is better not to attempt to give more than a pint at one time.

The stomach must be kept empty, but the patient may be permitted to have sips of hot water. Under no circumstances should she be permitted to have ice, if the stomach is upset.

I have found that a thin decoction of salep, given moderately cool in small quantities at a time, is most refreshing, and is readily retained when anything else would be rejected. This is made by rubbing up a mustard-spoonful of the powdered salep with a tablespoonful of cold water in a cup until a paste is formed, then filling the cup with boiling hot water, stirring it well, and setting it aside to get cold. This may be given either hot or cold in teaspoonful or tablespoonful doses, at first every fifteen or twenty minutes, and in larger quantity later on.

Pain.—Pain is more often complained of after minor gynecological operations, strange to say, than after abdominal operations. After simple curettage or a trachelorrhaphy

there is often more pain than after a hysterectomy. The nurse, if she is tactful, can do much to avert the necessity of administering an anodyne by reassuring the patient, allaying her fears, soothing her by rubbing the abdomen, changing her position, and diverting her attention. Some warm application to the abdomen, such as a hot water bag only partially filled so as not to be uncomfortably heavy, or a flat plate heated and wrapped in flannel, will frequently be sufficient to relieve the abdominal pain after minor operations. The backache following trachelorrhaphy or other operations where the uterus has been dragged down, is best relieved by turning the patient on the side and rubbing the back over the lumbar and sacral region either with the hand plain or wet with alcohol. A small pillow under the small of the back will often afford relief, or the nurse may kneel at the side of the bed and place both hands under the back with the palms up, holding them there for some time. Pain of this character is more often due to nervous restlessness, and subsides if the patient can be gotten to sleep for a few hours. One or two trional powders, ten grains each, given an hour or two apart, will often afford refreshing sleep for several hours.

Distention of the bladder with urine, or the presence of gas in the rectum, is often a source of pain after operation which subsides upon removal of the cause. If the patient cannot or does not pass the urine in four or six hours after operation a catheter should be used. The patient is often not conscious of gas in the rectum when its presence is causing pain. By inserting into the rectum the rectal nozzle from a syringe and permitting it to remain for half an hour or an hour, then removing it and reinserting it after an hour or two, the gas is permitted to escape and the pain is relieved. Percussion over the ascending or descending colon will reveal the presence of gas. When it is high up in the colon it does not come down past the sigmoid flexure readily after operations upon the pelvic organs, and insertion of the short rectal tube will not give the anticipated relief. It will then be necessary to pass the long rectal tube

of soft rubber up through the sigmoid. To prevent it from doubling upon itself it should be passed with the aid of water flowing through it so as to distend the rectum and smoothe out the folds. The tube should be attached to a fountain syringe, held three or four feet above the bed, and after passing the rectal tube in about four inches, the water is permitted to flow through it while it is passed slowly up into and through the sigmoid. With care the end of the tube can be carried up into the descending colon. Then the fountain syringe is detached and the water is permitted to escape from the bowel through the tube.

After an hour, if the gas is not expelled, from four to six ounces of the milk of assafœtida may be injected through the tube, which is then withdrawn. This stimulates the bowel and causes expulsion of the gas after an hour or two. The long rectal tube may be passed again if the gas cannot be expelled without it. A suppository of assafœtida, grs. viiss to gr. xv of cocoa butter, inserted into the rectum, will produce the same result, though it is slower in its action. It is, however, very much less objectionable and for nervous patients more satisfactory.

Turpentine stupes to the abdomen may be used sometimes to advantage where there has not been an abdominal incision. These are applied by dipping a thick piece of flannel, large enough to cover the abdomen, into very hot water, wringing it out so it will not drip, and sprinkling the surface with a teaspoonful of the spirit of turpentine, placing it on the abdomen and covering it with a layer of non-absorbent cotton or a thick towel. Before it cools off it should be removed and reapplied.

When the enema of assafœtida or suppository fails to give relief, an enema of turpentine may be given. This is an unfailing remedy for expelling gas from the intestine if it is properly given. It must be borne in mind that turpentine floats on water, and if given in the ordinary way through a fountain syringe, none of it gets into the bowel, though a small quantity may get into the lower rectum if all is allowed to run out of the bag. To be effective the turpentine must

be carried well up into the transverse and ascending colon. The nurse or attendant should be directed to fill a two-quart pitcher with water as hot as can be borne in the rectum, add to it a teaspoonful of spirits of turpentine, which floats on the surface, then, inserting the nozzle from the fountain syringe into the rectum, pour off about half a pint of the top of the fluid in the pitcher into the bag of the syringe and let this run out completely first. Then pour into the bag the remaining water. Thus the turpentine is poured off first and passes into the rectum, and the remaining water that is permitted to flow into the rectum afterwards carries it up into the colon and disperses it over the surface of the bowel throughout its entire length.

It is seldom that a patient cannot take the enema given in this manner, but where she has not sufficient control over the sphincter, it may be given in the same way through the long rectal tube passed up through the sigmoid.

Pain occurring after thirty-six or forty-eight hours following cœliotomy is more frequently from this cause (gas in the bowels) than from any other, and is generally relieved by some one of the methods described, and it is seldom necessary to administer an anodyne, but in some instances this may be required. I have found that by giving a hypodermic of morphia sulph. gr. 1-8, and atropia sulph. 1-200 or 1-150, and at the same time inserting one of the assafœtida suppositories into the rectum, a most satisfactory result is accomplished. The morphia quiets until the stimulation of the assafœtida can be obtained, and combined with atropia does not interfere with its action. In some cases when the patient is particularly nervous it is much wiser to pursue this plan than to disturb her by giving enemata.

Pain during the first twenty-four or thirty-six hours is generally due to the traumatism of the operation and subsides usually after that period. It is best not to administer opium for its relief, and it should not be given unless the pain is excessive and constant. Then it should always be given in the form of morphia and atropia, hypodermatically; never by the mouth. Unless the patient has taken morphia

frequently before the operation, one dose of 1-4 of a grain of morphia with 1-200 or 1-150 of atropia will be sufficient usually. If it does not relieve in an hour it may be repeated in half the dose.

If the patient has been obliged to take morphia for any length of time before the operation it will be impossible to withhold it afterwards if she suffers severe pain. These patients sometimes get into a condition of collapse resembling shock due to pain, which is only overcome by administering morphia. They are less able to endure pain than those who have not been compelled to take it before. But it must not be continued beyond forty-eight hours. It will interfere with movement of the bowels and the habit must be avoided.

Urine.—After minor gynecological operations patients can usually pass the urine naturally, but with some patients the anæsthetic seems to render the bladder insensitive to the presence of urine until it is over-distended. Then it cannot be voided. It is a good rule that unless the urine is passed naturally after six hours to have it drawn by inserting a catheter. After operations on the perineum, of course, the urine should be drawn at regular intervals—every six hours usually—to avoid soiling the wound or dressings until union has taken place.

After abdominal operations, and also after intravaginal operations, the patient should be permitted to pass the urine naturally if she can, but the catheter should be used when she cannot. The use of the catheter must be discontinued as early as possible, as its continued use is liable to produce vesical irritability.

When the catheter is used the greatest pains must be taken to preserve absolute asepsis. The catheter must be sterile. Glass or soft rubber catheters are preferable, because they can be rendered more positively sterile by boiling. The urethral orifice must also be made clean by irrigating, with the labia separated preferably, or by wiping carefully with a pledget of gauze or cotton that has been dipped into an antiseptic solution. The catheter must be passed under inspec-

tion and not by touch along the finger. The labia must be separated with two fingers of the left hand, exposing the urethral orifice, so the catheter may be inserted without coming in contact with the vulva.

After abdominal section there is usually a marked diminution in the quantity of urine unless saline enemata have been given. This, with the accompanying vesical irritation, may be obviated by employing saline enemata before the patient is removed from the operating table, and subsequently whenever the daily amount of urine falls below the normal.

Bowels.—As a rule the bowels may be left undisturbed for forty-eight hours after an operation, even after abdominal operations, if the patient is doing well. There is no actual need for alarm if they do not move before the fourth or fifth day. It is a mistake to make the patient uncomfortable and exhaust her by too vigorous efforts in this direction during the first two or three days following a grave operation. On the evening of the second day a dose of calomel (ten of the calomel triturates, one-tenth of a grain each, given at one dose, I prefer), followed by a dose of citrate of magnesia in the morning, is usually effective. If there is any disturbance of the stomach, the calomel tablets may be given one at a time at intervals of twenty or thirty minutes, and it is best sometimes for the same reason to give the saline in small doses repeated every half hour until the desired result is obtained. The citrate of magnesia is slower in its action than either Epsom or Rochelle salts, requiring usually four hours, and for this reason the latter are sometimes to be preferred. But they are usually so distasteful that the patient is not easily prevailed upon to take them. If they are administered in a glass of vichy or seltzer this objection is removed and they are rendered more active. A teaspoonful of either salt may be given in half a glass of vichy without the taste being detected.

When the bowels do not respond to the above, a high enema of either of the following may be given: Magnesia sulphate ℥ ii, spts. of turpentine ʒ ii, glycerine ℥ i and water ℥ iv, or castor oil ℥ ii with spirit of turpentine ʒ ii.

The long rectal tube must be passed up through the sigmoid with the aid of warm water flowing through it, if necessary. When it has been inserted as far as desired the water and gas may be permitted to escape, and the injection is given through a funnel or fountain syringe held some three or four feet above the bed. When all has passed through the tube, it should be slowly withdrawn, and the patient is made as comfortable as possible and kept quiet to prevent its immediate expulsion. After the first movement of the bowels a laxative should be administered every second day during convalescence.

Temperature During Convalescence.—It is by no means unusual to have the temperature go up one, two or three degrees, even after minor gynecological operations, and the same rise may occur after abdominal operations without significance. Should this rise continue for more than twenty-four hours its cause must be sought and removed. It is often caused by intestinal disturbance with distention, and subsides usually upon free movement of the bowels with expulsion of the gas. Pain will send up the temperature of sensitive patients, but it will subside with the pain or after restful sleep.

Persistent temperature above 100° F. indicates infection of the wound or peritoneum. If it occurs toward the end of the first week the wound should be inspected for points of suppuration along the line of incision or about the stitches. They should be examined carefully, and if suppuration is evident or hardness exists about a suture, it should be removed immediately, the opening should be enlarged for drainage, and a moist gauze dressing should be applied and changed frequently until the abscess has healed from the bottom.

Diet.—For the first twenty-four hours the stomach must be kept absolutely empty of food, and in some instances it is necessary to prolong this period for forty-eight hours. If the condition of the patient demands nourishment during this time, it is much better to administer it *per rectum* than take the chance of disturbing the stomach by too early inges-

tion of food. A cup of peptonized milk or of liquid beef juice (Wyeth's) may be administered by enema, warm, every six or eight hours, if necessary.

At first only small quantities of the simplest form of food should be given. The white of egg beaten up light with a drop or two of the essence of lemon, or any other flavoring the patient may prefer, and made cold by placing it on ice, may be given in teaspoonful or tablespoonful doses at first. A very palatable way of preparing the white of egg when it is distasteful raw, is to beat it up into a froth in a cup, which is then placed in hot water covered on the fire and it is steamed until cooked lightly. This may be given warm, a little at a time, until the stomach becomes tolerant of larger quantities.

A little later, scraped lean beef, carefully broiled, may be given, with perhaps a small piece of dry crisp toast. Coffee without cream or sugar may be added to this and is a valuable stimulant. At this time the liquid beef juice (Wyeth's), one or two teaspoonfuls in a small cup of water, may be given either warm or cold.

Cold jellied consomme is relished by some patients, and though it contains very little nourishment, it may be given when it is fancied. The addition of the white of egg or the whole egg makes it more nourishing.

Milk is the most unsuitable form of diet after operations, especially after abdominal operations. Few patients can take it without having it create the most annoying intestinal disturbance with formation of gas. It is little better even when peptonized. Koumiss and buttermilk are open to the same objection.

Barley gruel, made with a very little milk and strained, is very palatable and is borne well by most patients. This may be given warm in small quantities at first.

For the first three or four days, then, the diet should consist of liquid food, as described above. After the fourth or fifth day, if the patient is doing well, and the stomach is in good condition, we may begin with lean beef, broiled rare, and crisp toast with the crust of the bread removed. Lean

beef, chopped fine, after being deprived of all the fat and stringy fiber, and broiled carefully in thick cakes of uniform thickness, even out to the edges, is easily digested and nutritious. After it is cooked, it is seasoned with butter, pepper and salt to suit the taste of the patient. This may be given twice a day, with crisp toast buttered, and some form of light soup. The other meal of the day may consist of eggs, poached or boiled soft, or some form of meat-jelly with toast.

Milk or cream toast should never be given. It will not be digested, and will ferment and cause intestinal distention.

After the first week, if everything progresses well, a more regular diet, consistent with the patient's condition and her appetite therefor, may be given.

After nausea has ceased, the patient may be permitted to take of good pure water all that she desires, but it should not be given too cold or in large quantity at a time. If she desires a glassful at a time, she may have it, but she should drink it slowly and not all at once.

Sweets of all kinds are to be withheld during convalescence, because they are almost certain to set up fermentation and cause discomfort by producing intestinal distention. The same is true of fruits, even fresh fruits in season. They should never be given during the first two weeks of convalescence.

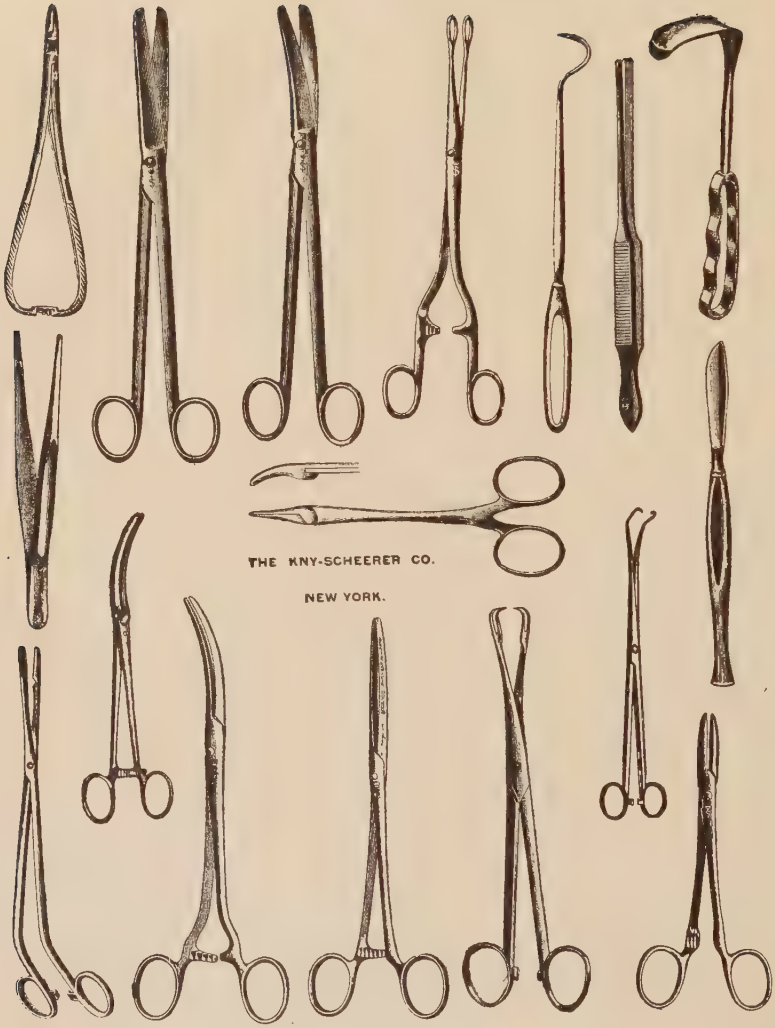


PLATE I.

Abdominal Hysterectomy Set.

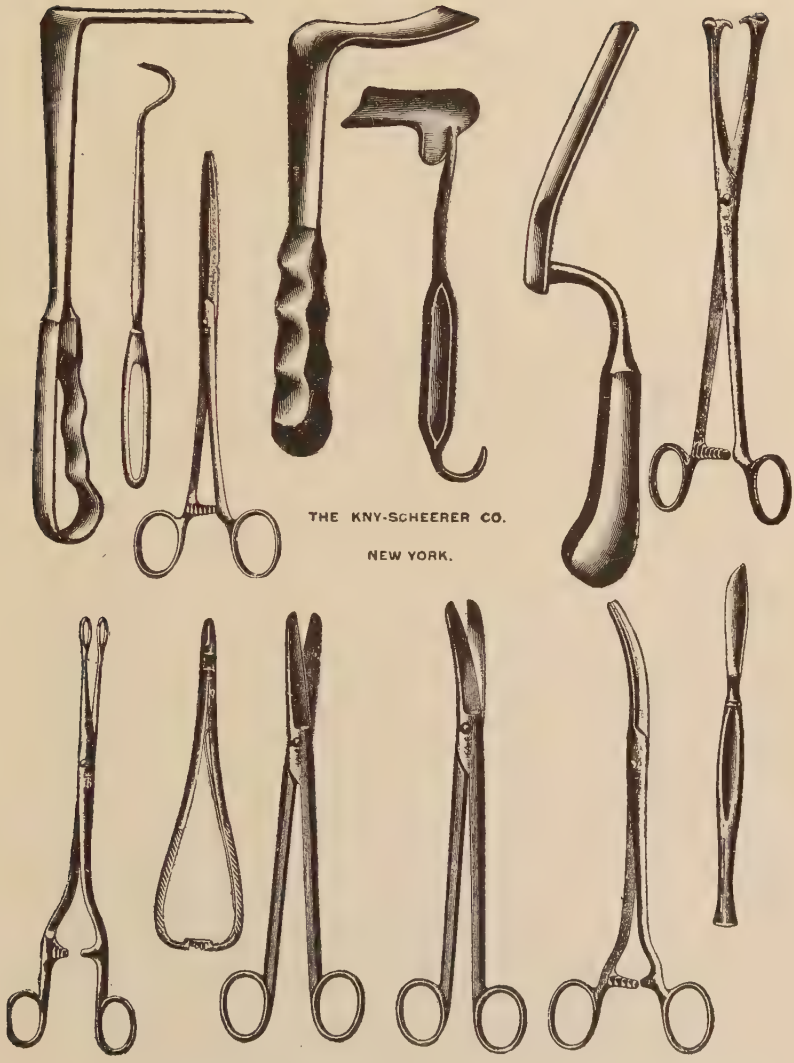


PLATE II.

Vaginal Hysterectomy Set.

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